FLIGHT
and
AIRCRAFT ENGINEER

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The Outlook

Air Strength

UNEASINESS was the prevailing feeling in the House of Lords debate on the Royal Air Force last week. That the seriousness of the situation is fully realized in all quarters was evidenced by the fact that there was no attempt to make it the subject of party politics.

Three of the speakers have held the highest posts in the field of air power: The debate was opened by Viscount Templewood, who, as Sir Samuel Hoare, was Air Minister three times between 1920 and 1930. Viscount Trenchard is the father of the R.A.F. and has done more than any man to build it up and organize it into the efficient Service it is. And Viscount Portal, whose maiden speech it was, has grown up with and in the R.A.F., ultimately becoming Chief of the Air Staff, with all the responsibilities which that post entailed during the second world war.

No one would thus deny that these three speakers between them have the fullest collective and individual knowledge of what air power means. All were concerned at the failure to attract into the R.A.F. the right men in sufficient numbers. That concern was shared by practically all the other speakers, but it cannot be said that the Government spokesmen, Lord Henderson and Viscount Addison, did very much to allay the fears expressed. While agreeing with the necessity to do everything possible for the R.A.F., they promised little beyond ensuring that the weighty matters raised should be given due consideration.

"Targets" were set up by Viscount Templewood and Viscount Trenchard. The former expressed the belief that an Allied Air Force strong enough to deter any aggressor should include 100 jet-fighter squadrons, 150 latest-type long-range bomber squadrons, 50 pilotless rocket units, and 150 transport squadrons. Viscount Trenchard emphatically declared that it was not beyond our means, even in peacetime, to have an Allied Air Force overwhelmingly superior to anything opposed to us. "If I were thirty years younger," he said, "and ever in a position to offer advice and take responsibility for that advice, I would say that a force of 100 squadrons of short-range fighters of our own and our American friends, 150 squadrons of long-range bombers (since we must not bomb the countries Russia is occupying), plus 150 squadrons of long-range fighters to protect our long-range bombers, and 150 squadrons of transport planes . . . would be sufficient to prevent a war."

Other speakers supported the view that only by air power could the allied nations counteract the numerical advantage which Russia has in the matter of manpower. That argument few would probably seek to contradict, but, as Lord Balfour of Inchrye said, if the present manpower shortage in the R.A.F. is allowed to continue, such a strategic concept falls right away. He asked the Government to tell us how many fighter squadrons to-day, assuming an initial equipment of sixteen aircraft, could put up six aircraft, or even five or four, in a sustained effort of flying day after day.

That is a grim picture, but it contains no great exaggeration, as anyone will know who has access to, or lives near, one of the R.A.F. stations. The pilots are there, but the number of experienced ground crews is too small to ensure serviceability of more than a fairly small percentage of the aircraft on establishment.

Manning the R.A.F.

HUMAN rather than technical problems having become the hindrance, what is to be done? The Government appears still to be under the delusion that National Service can to some extent help the R.A.F., and that by increasing the period from one year to 18 months, all the Services would benefit. (Even that is being opposed by certain Labour Members.)

The fact is, of course, that no practicable scheme of National Service will do very much to relieve the trouble from which the R.A.F. suffers. Aircraft and equipment are getting more and more complicated, and have become far removed from the days when, as Viscount Portal recalled, two men, neither highly trained, could look after one aircraft. It is not only that many more men are required nowadays to keep an aircraft flying; they need much more extensive training. Operational efficiency of the R.A.F. depends almost entirely on the regular officers, airmen and airwomen. The real problem is how to attract them.

The figures announced for increases in pay and/or allowances may help, but we feel sure more than that is wanted. Provision of better housing and amenities is needed, but will not by itself nor in conjunction with better pay, ensure the desired result. More than one speaker in the Lords debate stressed the importance of making better known the work of the R.A.F. in general and of its individual units in particular. The Navy was held up as an example, with its carefully nurtured veneration of Nelson and its "build-up" of names of famous ships. It was suggested that by giving squadrons names instead of numbers, a similar tradition could be built up in the R.A.F.

This is, of course, already done in the case of the Royal Auxiliary Air Force, but we doubt if its extension to the R.A.F. squadrons would meet with general approval. We cannot imagine that No. 1 Squadron, to take but one example, would look with favour on being named Somebody-or-Other's Own. That squadron goes back to balloons and thus has its roots in the previous century. But that much could be done by energetic publicity of the right sort there is no doubt. Lord Gifford suggested that young officers from Cranwell might talk to boys in the schools, and that R.A.F. officers with fine war records might talk to the headmasters. In short, "getting it over" to parents that they should encourage their sons to volunteer for service in this great Royal Air Force.

The Air League of the British Empire is doing good work in exactly this direction, but at the moment it is sadly handicapped by funds. Not long ago, Lord Tedder and Sir Philip Joubert warmly voiced a plea for more generous support of the League. That appeal deserves to be heeded. Whatever the R.A.F. itself might do, the League could certainly extend the range.

And finally there is too much secrecy—unnecessary secrecy—based on grounds of security. As one speaker said in the Lords debate, refusal to disclose information so easily results in a suspicion that all is not well. It is impossible to get the general public to take an intelligent interest in a Service about which it is not permitted to know anything. Certain things must obviously be kept secret, but a great deal of information could be disclosed which would help to revive interest in the Royal Air Force without giving any real assistance to an enemy.

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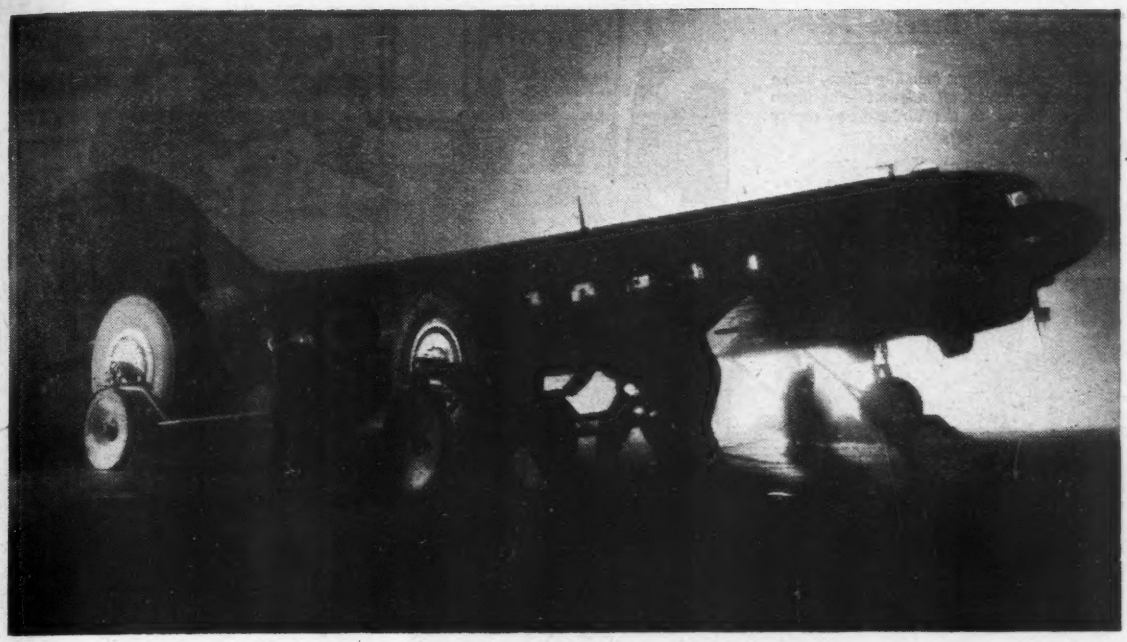
Forthcoming Events page 671

STRIKING OIL: Hunting Aerosurveys Ltd. are mapping vast areas of Iran for the Anglo-Iranian Oil Co. Ltd. Geologists expect the resulting maps and photographic mosaics to give a clear picture of the oil and mineral resources in this part of the world. The survey is being flown by Bristol Freighter aircraft operating at 20,000ft. Some further details appear on page 652.



The night-shift loading York landing wheels into a Dakota ready for delivery on the morrow.

"Plainfare" Service

Activity at Transport Command Central Servicing Unit in Keeping the Berlin Air Lift at Full Serviceability

WHEN something spectacular is displayed before the wondering public eye, that eye too often registers the facile panoply and little else. But in this grossly material world, spectacle is rarely self-sufficient; behind the polish of the finished performance lies an enormous amount of sometimes wracking labour. It is so in the instance of the Berlin Air Lift—officially designated *Operation Plainfare*. In the present connection we are, of course, regarding only the R.A.F. section of the operation, but in general terms the same evaluation must hold good both for the American and the Civil British sections. The Yorks, Dakotas and Hastings shuttle back and forth along the corridors between Wunsdorf and Gatow doing a job of aviation transport never before even remotely matched in tonnage shifted against time, and to such a close-cut schedule. But were it not for closely correlated maintenance support, this majestic aerial caravanning would have to slow down considerably if not halt altogether.

In April, 1946, the airfield at Honington, Suffolk, was handed back to the Royal Air Force after having served as a U.S. Eighth Army Air Force station during the greater part of the war. It was at once established as the Central Servicing Unit of Transport Command. Since the inception of the Berlin Air Lift, five months ago, the normal working of Honington has been considerably speeded up and, although the central servicing facilities for Transport Command aircraft in the United Kingdom are still carried on, the Command aircraft being used for *Plainfare* now have first call on Honington's resources.

Nominally, Honington services Merlin T. 24/2 power plants for Yorks, main and tail wheel and tyre assemblies for Yorks, Hastings and Dakotas, radio and radar equipment for Dakotas, and instruments and electrical gear for York and Hastings. Some scale is given to this activity by figures, *viz*: from May, 1946, to date, the unit has handled 1,672 power plants, 8,281 wheels of all types, 30,620 instruments, and 239,885 sparking plugs. At the present time the handling rate is of the order of 125 power plants, 600 wheels, 1,000 instruments and 15,000 sparking plugs per month. In other terms, this constitutes between 400 and 500 tons a month and a flight mileage of about 100,000 per month.

Replacement

Transport Command aircraft operating the Air Lift are serviced at their own bases, and unserviceable items in the categories already mentioned are returned to Honington. As these come in from the B.A.F.O. stations in Germany and Transport Command stations in England, they are immediately replaced by serviceable items from stock at Honington. To ensure that this return and delivery service is operated at maximum efficiency and with least delay, a flight of six Dakota freighters, known as the "Plumber Flight," is employed. The flight is based at Honington.

In the event of an emergency—a damaged wheel or a power plant failure—occurring to a *Plainfare* aircraft at some place other than its normal base, the replacement item is flown from Honington direct to the grounded aircraft and the defective unit brought back to Honington for reconditioning.

If a signal requesting an item is received from Germany in the morning, the replacement usually reaches the grounded aircraft the same afternoon. Likewise, a signal received at Honington in the evening will ensure delivery the following morning. Just how clean-cut the organization is may be gathered from the fact that within 20 minutes

"Plainfare" Service . . . . .

(Right) In the Flight Planning Office, notice of a job is received, all relevant information collated, issued to the aircrew and thence progressed.

(Below) Nerve-centre of the operational organization at Honington is the progress and planning room. Signals of demands are received in here and the issue initiated and progressed as a continuous movement.

of the receipt of the signal at Honington, the required component, be it a power plant or a DR compass, is put in a Plumber Flight Dakota and sent on its way to Germany.

In addition to those items we have enumerated, and which Honington deals with itself, the station further serves as a clearing house for all individual spares required by Air Lift aircraft in Germany; that is to say, whereas Transport Command aircraft in this country draw their individual spares from the various Maintenance Units (other than those dealt with by Honington) *Plainfare* aircraft requiring similar items make their demands on Honington. The prefix *Plainfare* to such requests—which are known as AOG, i.e., aircraft on ground, and IOR, i.e., immediate operational requirement, demands—ensures immediate priority. On receipt of such a demand, Honington relays it to the appropriate Maintenance Unit, which forwards the required item by the fastest possible means. It is then flown from Honington by the first available Dakota. This method has been established to result in a considerably quicker movement of spares than was possible when the requirements for aircraft in Germany were demanded individually from a number of separate Maintenance Units.

Tight Schedules

One of the interesting maintenance aspects which has emerged from the Air Lift operations is the different provisioning requirements resulting from the mode of that operation. First, there is the fact that the aircraft are making landings of the order of one each hour instead of the more normal landing every eight to ten hours. What is more, this is aggravated by the increased landing loads. So tight is the Air Lift flight schedule that if an aircraft is off-time at the final beacon by more than 15 seconds early or late, it must return to base: similarly, if a boob landing is attempted, the aircraft must again return to base. This stringency means a 200 per cent fuel requirement, and further means that the aircraft lands at its maximum landing weight on at least every other touchdown. It is not without interest in this connection that the maximum landing weight for the York was put up 5,000 lb overnight when *Plainfare* got started.

As far as the operational side of the station is concerned, there are two administrative centres, namely, Planning and Progress, and Air Movements. The Planning and Progress centre, as its name signifies, is the control in and from which the maintenance service is governed. In the centre of a quite large room is a circular desk, having as its heart a small table with a battery of phones. This is the reception for all incoming demands. Around the walls of the room are large blackboards allotted to power plants, airframe modifications, wheels, plugs, airscrews, thrustats, radar, radio, instruments, and electrical gear. All relevant information on the number of items in hand, both awaiting delivery (stock) and in process of overhaul, are recorded, in addition to the progress of components in transit. Thus the complete picture existing at any one time is immediately apparent. Adjacent to the central control room is the technical library, records, establishment section, drawing office and photographic section. A very complete administrative unit.

The Air Movements section is virtually an ops. room. Into here comes all information relevant to the flying side of the service. Flight plans are worked out, crews briefed, and progress of flights maintained. That the standard of flying in the Air Lift is very high is readily appreciable from the closeness of the schedule imposed, and by the same token, although not in quite the same fashion, the Plumber Flight standard is equally high. The insistence that Air Lift aircraft are kept at maximum serviceability means that the Plumber crews have to operate what is virtually an all-weather flight. The extent to which this title is justified is indicated by the fact that November 22nd and 23rd were the only occasions in the past two years during which the Plumbers have been grounded. East Anglia was fog bound.

The servicing unit side of the station works in day and night shifts, respectively from 0800 hours until 1700 hours, and from 2130 until 0630 hours. The Air Movements section starts at 0800 hours and nominally finishes at 2000 hours when the last aircraft usually arrives, but, of course, it is sometimes as late at 2400 before the last aircraft gets in. In the aircraft loading section work is nightly carried on until 2300 hours as normal routine, so that the aircraft is ready to leave first thing the following morning.

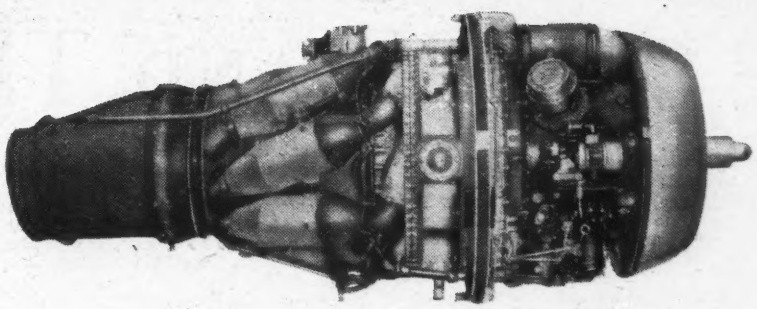
The Officer Commanding, R.A.F., Honington, is G/C. M. Q. Candler, and his staff are, respectively: W/C. L. D. Maver, A.F.C. (O.C., Administrative Wing); W/C. H. Furner, O.B.E. (O.C., Technical Wing); S/L. H. N. Phillips, D.F.C., (O.C. Flying Wing); F/L. L. G. Tancred (O.C., "Plumber" Detachment); S/L. J. T. Main, O.B.E. (Chief Engineer); S/L. H. J. Hemmings (Chief Radio Officer); S/L. R. H. McCullough (Chief Electrical Officer); and F/L. C. H. Thomas (Station Adjutant). There are 120 senior N.C.O.s and 760 lower ranks on the strength, who are divided as 590 in the Technical Wing and 190 in the Administrative Wing. In addition to these personnel, there are between 60 and 70 in the Flying Wing and a complement of about 50 W.A.A.F.

SURVEY COMPANIES' POSTS

MAJ. GEN. A. M. CRAIG, C.B., O.B.E., has been appointed to the Boards of both the Air Survey Co., Ltd. and Aerographic Surveys, Ltd., both of which are subsidiaries of the Fairey Aviation Co., Ltd. Maj. Gen. Craig joined the Boards of these companies after 32 years with the Royal Marines.

DART DETAILS

Rolls-Royce's Small Turboprop Described



RELEASE of detailed information concerning the Rolls-Royce Dart turboprop has been eagerly awaited, for although the Dart was one of the first, if not the first, of the small British turboprops to be designed, built and flown, all but superficial data had been withheld. The company's preoccupation with the production of the Nene and Derwent turbojets and the development of other military power units which have priority, did not permit concentration on Dart development to the extent that it would have wished. However, so encouraging has been the performance of the four Darts installed in the Vickers Viscount that the interest of the whole industry has been further stimulated in these units and in small turboprops for civil aircraft generally. Darts are now available for civil or military use.

Development running to date exceeds 3,250 hours, and flight development, which has been intensified during the last few months, has been carried out in a Lancaster (five-engine layout), a Wellington, powered solely by two Darts and, finally, the Vickers Viscount airliner. Descriptions and power figures given below refer to the Dart 1, but a later version, in which detail improvements have been made, is likely to be announced shortly. The present maximum power rating is 1,000 s.h.p. and 310 lb thrust, and it is interesting to note that for perhaps the first time on a British engine, a maximum power figure with water/methanol of 1,300 s.h.p. is quoted for the Dart turboprop. It is expected that in the near future 1,400 s.h.p. will be achieved. After recent test runs the strip condition has been reported as excellent and very promising for future operation. The higher power output expected after further development will almost certainly be accompanied by improved fuel consumption figures.

Control of the Dart in the air has not presented any great problem, requirements having been studied and met at least in principle, with the Trent-Meteor, the first aircraft ever to fly with turboprops as the sole power source.

Design Features

Principal features of the Dart, which is described in more detail below, are a two-stage centrifugal compressor and two-stage turbine. Following Derwent and Nene practice, two shafts joined by a toothed coupling provide a common axis for the impellers and turbine wheels. They are directly coupled and rotate as a single component. The use of this type of compressor is a logical outcome of Rolls-Royce experience with two-stage centrifugal superchargers on piston engines—the most efficient compressors of their type ever produced.

Reduction gear. A three- or four-blade reversible-pitch airscrew is driven through a double reduction gear, having a helical high-speed train and a final spur-gear drive. The two gear trains are connected by three layshafts, the high-speed sun wheel is driven from the forward end of the impellor shaft, and the final drive is through a large annulus splined to the airscrew shaft. This shaft and all gears are carried in roller or ball bearings. The reduction ratio is 0.091:1. Fuel and oil pumps and constant-speed unit are driven through bevel gears from one of the layshafts, while the starter motor drives through a bevel gear on the sun wheel shaft.

Compressor. Air enters through an annular duct in the intake casing and, after passing through the first-stage compressor, enters an inter-stage duct leading to the second-stage compressor from whence it is fed through the seven elbows to the combustion chambers. Both impellers carry 19 light-alloy vanes with steel lead-in guide vanes. At maximum r.p.m. the air mass flow is 18 lb/sec at a compression ratio of 5.5:1. With this type of compressor there is no tendency to surge or stall on opening up.

Combustion Chambers. There are seven combustion chambers with cast expansion chambers and downstream fuel injection, following standard Rolls-Royce practice. Igniters are provided in No. 3 and 7 chambers. The flame tubes are of Nimonic 80. A feature of the hot section is the configuration of the chambers which are at an angle to the fore and aft line.

Turbine. A two-stage axial turbine design is employed, the blades of the high- and low-pressure stages being carried on separate wheels. The blades have fir-tree type anchorage. The separate turbine wheels are coupled and bolted to a single shaft, are separated by a steel-strip seal, and are cooled at both front and rear faces by air tapped from the compressor. The high-pressure turbine disc which carries 123 Nimonic 80 steel blades is of Jessops 18B steel, while the low-pressure stage, carrying 108 blades, has its disc made from S.62 stainless steel.

Lubrication. The oil tank is cast integrally with the intake casing, thus effecting a weight-saving and providing a self-contained lubrication system. Moreover, the hot oil assists in preventing ice formation in the intake. The cooling air to an oil cooler mounted on top of the casing is taken from a secondary intake concentric with the main casing. The oil tank is divided into two compartments, one of three gallons capacity for the engine requirements, the other holding one gallon for airscrew feathering. A gear-type pump supplies oil to the reduction gear and bearings at 30 lb/sq in at a nominal flow rate of 460 gal/hr. Three scavenge pumps return the oil to the tank via the cooler.

Fuel system. Fuel is supplied to the burners at between 40 and 800 lb/sq in, according to engine speed, by a swash plate plunger-type pump. The pump incorporates an overspeed governor set at 15,100 r.p.m., but the speed is normally controlled by the c.s.u. to a maximum of 14,500 r.p.m.

Controls. Two cockpit controls are needed for the Dart: a power lever and a high-pressure shut-off cock. The power lever is interconnected with the c.s.u. and the shut-off cock is linked with the airscrew feathering controls. Reverse pitch for braking is selected by moving the throttle lever through a gate and the blades may be feathered by moving the shut-off cock past the closed position. An unfeathering button returns the blades to fine pitch. For starting, a cut-out connected with the airscrew prevents the operation of the engine starting system unless the blades are in zero pitch. To prevent the airscrew blades assuming zero or reverse pitch in the air, a safety device is provided which is in operation until the weight of the aircraft is on the undercarriage.

Accessory Drives. A drive for the accessory gear box is taken vertically from the main shaft centre coupling, immediately behind the compressor, through a train of bevel gears to a housing on top of the intermediate casing. A universal coupling provides the final drive to the gear box. Four mountings are provided at 90 degrees on the horizontal and vertical centre lines of the compressor casing. Three are sufficient for an installation.

Weight and dimensions of the Dart 1 are: Diameter over cowling, 38.5in; length to exhaust cone, 94.75in; frontal area, 8.10 sq ft; weight without airscrew, 850lb.

R.R. DART 1 SEA-LEVEL PERFORMANCE

Power rating	Turbine r.p.m.	m.p.h.	Shaft h.p.	Thrust (lb)	Fuel consumpt (g.p.h.)
Take-off and Max ...	14,500	0	1,000	310	117
		100	1,025	253	119
		200	1,075	196	121
		300	1,165	143	123
		400	1,290	96	128
Max cruising ...	13,000	0	690	190	90
		100	710	138	90
		200	755	100	92
		300	820	56	94
		400	910	17	96

HERE AND THERE

British Jets for Denmark

ACCORDING to reports from Copenhagen, a special delegation is soon coming to London to negotiate with British manufacturers for the purchase of jet aircraft, of which the Danish Government is to buy a total of 60 over a period of three years. The statement that Danish pilots will be trained in Sweden suggests that some of Denmark's fighter squadrons may be equipped with Vampires, as are a number of Swedish units.

Jet Book Translations

"PROPULSION par Reaction" is the title of the French translation of the *Flight* handbook "Gas Turbines and Jet Propulsion for Aircraft," by G. Geoffrey Smith. Dunod, 92, Rue Bonaparte (Vle), Paris, is responsible for the French edition which embodies a preface by M. Marchal, Ingenieur en Chef Militaire de l'Air.

An edition has also been published in Dutch, and one in Spanish is in course of preparation.

De Havilland Engine Co.

AT a meeting of the board of directors on November 26th Mr. A. F. Burke, O.B.E., who for some years has been director and general manager of the de Havilland Engine Co., Ltd., was adopted managing director of the company. Other positions—Major F. B. Halford, chairman; Mr. J. L. P. Brodie, engineering director; and Mr. Hugh Buckingham, business director—remain unchanged. The directors of the de Havilland Aircraft Co., Ltd., are also directors of the engine company.

Sikorsky Helicopter Film

A LIMITED number of free tickets are available to the public for a short sound and technicolour film on the Sikorsky helicopter to be followed by a discussion on new patents, which is being given by the Institute of Patentees. The film will be shown on December 14th at Caxton Hall, at 7.30 p.m., and Professor A. M. Low will be in the chair. Applications for tickets should be made to the General Secretary, Institute of Patentees, 207/8, Abbey House, Victoria Street, S.W.1.

Blackburn Aircraft Ltd. Annual Report

SOME important announcements are made by Mr. Robert Blackburn in his company's annual report of which details are given below. It is learned that for health reasons he personally is to give up his position as joint Managing Director but will remain Chairman of the Company.

Blackburn—General Aircraft Merger

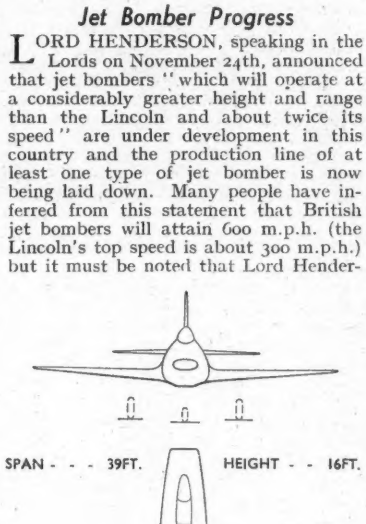
AS we go to Press confirmation is received of the merging of the Blackburn and General Aircraft companies. General Aircraft, Ltd. (£1 million) will hand over all aircraft business to Blackburn Aircraft, Ltd. (£4 million) in return for a substantial share interest in that company, the rental of property and purchases of stocks. General Aircraft have been engaged in producing a prototype of the large four-engined Universal freighter, tailless research gliders for the M.o.S. and a target-towing Mosquito version. The Blackburn company is to redeem all its 5 per cent preference shares. A profit of £125,395, tax deducted, is shown for the year.

Planet Satellite Backing

THE Blackburn company is also taking an interest in the Planet Satellite, Mr. J. L. Bennett-Baggs, director, joining the board of Planet Aircraft, Ltd. G/C. Searle's very advanced light aircraft is thus backed by the Distillers, I.C.I. and Blackburn companies.

Jet Bomber Progress

LORD HENDERSON, speaking in the Lords on November 24th, announced that jet bombers "which will operate at a considerably greater height and range than the Lincoln and about twice its speed" are under development in this country and the production line of at least one type of jet bomber is now being laid down. Many people have inferred from this statement that British jet bombers will attain 600 m.p.h. (the Lincoln's top speed is about 300 m.p.h.) but it must be noted that Lord Henderson was referring to *operational* speed. That of the Lincoln is some 215 m.p.h.



FRENCH FORMULA: General arrangement of the Nord 2,200 deck-landing Nene-powered strike aircraft. Very small ailerons are used, in conjunction with spoilers, and additional spoilers and flaps are provided for dive attacks. The flattened intake is interesting. The dimensions shown are approximate.

Australian Agents for SAAB

MICHAEL CHRISTIE, Saab's sole concessionnaire for the Commonwealth, has recently signed an agreement with the Swedish company appointing Scholefield Goodman and Sons, Ltd., of 23, Lime Street, E.C.3, and their Australian agents, Howard F. Hudson Pty., Ltd., of Sydney, as sole agents for the Scandia and Safir in Australia and New Zealand, Tasmania and New Guinea. Mr. Hudson, of the Australian company, is at present in England, and Capt. P. G. Taylor, G.C., M.C., who will handle the sales of the aircraft in the countries mentioned, is expected to return to Australia shortly; he is at present in the United States. Capt. P. G. Taylor was formerly Sir Charles Kingsford Smith's observer.

Chipmunk Production

AFTER some two years' trials in the hands of operators not only in Great Britain and Canada but also in Australia, New Zealand, India, South Africa, Argentina, Brazil and Belgium, the Chipmunk has become a fully developed military and civil trainer ready to replace the Tiger Moth anywhere in the world. The Royal Air Force version carries standard blind-flying panels in both cockpits, two-stage amber and red lighting, four-channel V.H.F. and electrical intercom. The Chipmunk is in production in Canada, and contracts include a substantial order placed by the Indian Government flying schools.

Film on Tool Steels

IN a film made for Arthur Balfour & Co., Ltd., of Sheffield, by Cinechrome, Ltd., machining operations and assembly of crankshafts for Bristol Centaurus engines are shown. The film deals with the manufacture of special tool steels for machining such alloys as D.T.D. 306, which is a chrome molybdenum steel with a tensile strength of 62 tons from which the Centaurus crankshafts are manufactured. The film also contains a view of the Brabazon in the Filton assembly hall. Incidentally, Cinechrome, Ltd., have pioneered the direct production of 16-mm films, which it is said are cheaper to make than the usual 35-mm films from which 16-mm copies are subsequently taken.

Oil Survey in Iran

BEGINNING a two to three year contract for aerial exploration in Iran a Hunting Aerosurveys expedition left Bovingdon at the end of November for Abadan. The aircraft being used by the expedition is a modified Bristol Freighter Type 170 which carried over a ton of photographic equipment in addition to the air survey operating gear and crew of seven. Interior modifications for the convenience of the crew have been carried out and much of the survey flying will be done at over 20,000ft. Hunting Aerosurveys are undertaking this operation for the Anglo-Iranian Oil Co., Ltd., and this is the seventh opera-

HERE AND THERE

tion of this kind, three having been completed in the years before the war and two in 1946 and 1947. The expedition will remain in the field for six months of each year and will carry out aerial exploration of large areas of the uncharted mountains and deserts in Iran. A photograph of the aircraft appears on page 648 in this issue.

Kittyhawk in Washington

AFTER crossing the Atlantic packed in a crate, the Wright Brothers' famous *Kittyhawk* arrived in Washington on November 23rd. A brief ceremony was held at the Smithsonian Institute, where it is to be displayed on December 17th, the anniversary of its first flight 45 years ago, and the principal speaker was Mr. William McCracken, holder of the first pilot's licence in the United States.

25 Years with A.W.A.

ON November 16th Mr. H. M. Woodhams, C.B.E., F.R.Ae.S., Director and General Manager of Sir W. G. Armstrong Whitworth Aircraft, Ltd., completed 25 years with the company. Mr. Woodhams, who has been engaged in the aircraft industry since 1909, joined A.W.A. as chief inspector in 1923 and has been promoted successively to assistant works manager, works manager, assistant general manager and general manager. He was appointed general manager in 1937 and in 1941 became a member of the board. Mr. Woodhams is also president of the Coventry Aero Club.

Mr. H. M. Woodhams.

Exports to Africa

A RECENT analysis of the freight on a Lancastrian flying on the joint weekly B.O.A.C.-South African Airways Springbok cargo service to Egypt, East Africa, Rhodesia and South Africa indicates the classes and volume of goods being exported by air to the African continent. Among the items carried by this aircraft were books, newspapers and other literature amounting to some 1,600 lb; automobile, aeronautical and other machine spare parts accounted for 1,500 lb. Other classes of merchandise were radio and electrical goods, 1,350 lb; fabrics and clothing, 1,100 lb; toys, 300 lb; jewellery, silverware and watches, 190 lb; films and lantern slides, 160 lb; instruments and tools, 140 lb; drugs, 70 lb; antiques, 65 lb. The same aircraft carried other items including leather goods, printing blocks, confectionery, tobacco, gramophone records and 1 lb of bagpipe reeds. Mail was also carried.

Petroleum Research

AT the recent annual meeting of its research experts, the Royal Dutch Shell Group adopted a research budget for 1949 amounting to £6,000,000. The programme embraces fundamental research and all phases of research into petroleum extending from the initial prospecting for crude oil to the use of every kind of petroleum fuel, lubricants and other products. About 4,000 employees are now engaged on research activities for Shell, whose most modern and best equipped laboratories are in the U.K. at Thornton, Cheshire, the Netherlands and the U.S.A. In 1948 the Shell Development Co., at Emeryville, California, received the American Institute of Chemical Engineers award for chemical engineering achievement in recognition of its contribution to the manufacture of synthetic glycerine from petroleum. A full-scale synthetic glycerine plant was completed in September at a cost of over 9 million dollars. The plant will produce 35,000,000 lb of synthetic glycerine annually.

THUNDERBOLTS IN TURKEY: Turkish Air Force ground crews at work on Republic Thunderbolts at Izmir air base. The Turkish Air Force has received a considerable amount of military aid from the U.S.

News in Brief

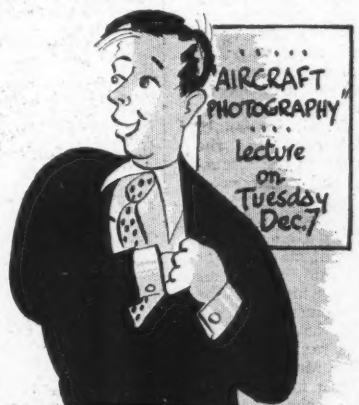
AT a recent agricultural convention in Dodge City, Kansas, 94 of the 150 farmers attending came in their own private aircraft.

* * *

When Mlle. Marcelle Choisnet remained airborne for 35 hours in a glider near Aix-en-Provence recently, she broke her own record and became the world's woman gliding champion.

* * *

Successful demonstrations of television reception in an aircraft have been made in America by United Air Lines. Two standard table receivers showed reception from three stations with little distortion. The height of the aircraft over Chicago was 2,000ft and another test was carried out over Milwaukee at 6,300ft.



"Well gentlemen, that concludes the Lecture, but here are a few pictures I brought back from the last Paris show."

* * *

The R.A.F. Reserves Club (c/o The R.N.V.R. Club) have arranged a Christmas Ball at the Savoy Hotel for Tuesday, December 21st. Music will be supplied by "Herr Crow's Band."

* * *

An instrument-carrying balloon released during September reached a height of 140,000ft (about 26½ miles), nearly four miles higher than the previous record. The instruments were used by the Army Signals Corps to provide data for weather forecasting and the control of guided missiles.

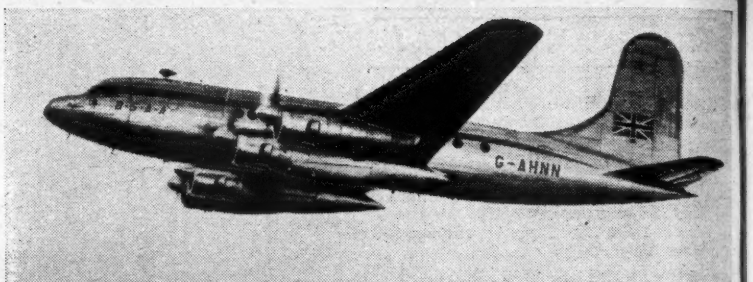
* * *

Following the announcement that Captain Sir Geoffrey de Havilland and the Rt. Hon. Lord Balfour of Inchyre had agreed to serve as vice-presidents of the Ultra-Light Aircraft Association, which appeared in *Flight*, November 18th, it is now learned that Mr. F. G. Miles has accepted a similar office. This brings the total number of vice-presidents to five. It is possible that one further appointment may be made in the near future.

* * *

Speaking in the House of Commons recently, Mr. Skeffington referred to provisions for spraying insecticide from the air to combat the effects of the tsetse fly on the cattle in Africa. It had been stated that there were two aircraft engaged on spraying, and it is understood that a helicopter is on order for this work, but Mr. Skeffington contended that this was insufficient for an area as large as Western Europe.

October Aircraft Exports and Imports : Ambassador Full Load Flight Tests :



CIVIL AVIATION NEWS

Light Aircraft Maintenance Schedules

TUDOR IV : In addition to Lancastrians used by B.S.A.A. on the Lisbon-Azores route to South America and Yorks which fly via Lisbon, Dakar, Natal to Buenos Aires, Tudor IVs are used on the services which fly via Iceland, Gander, Bermuda and Jamaica. The Tudor service operates once a week to Jamaica.

I.A.T.A. AGREEMENT ON FUTURE AIR RATES

DESPITE generally rising costs of equipment, fuel, material and services, agreement to maintain rates for passenger fares and cargo on international scheduled airlines throughout next summer was unanimously reached by representatives of I.A.T.A. member companies in the recent Bermuda meeting referred to in *Flight*, November 4th. Except for small increases between Europe and South America and minor adjustments elsewhere, basic passenger fares and cargo rates for the entire international system served by the 71 members of I.A.T.A. will generally remain unchanged. An intensive study has been begun of the possibilities of introducing tourist class rates for world air travel by the autumn of 1949. Present rate resolutions expire on April 1st, 1949 and those recommended at the Bermuda meeting will be effective until the end of September, 1949. A special committee of airline traffic executives has been appointed to explore the entire problem of tourist rates and to report to another I.A.T.A. conference meeting scheduled for May, 1949. If their report is acceptable to the Conference tourist rates could be introduced by October, 1949, wherever there is the public demand and to the limit of available equipment. This committee will also study the question of special rates for out-of-season travel, excursion fares and other means of cutting the cost of air transport. Mr. W. G. Lipscomb, Chairman of the Bermuda Conference, announced that the meeting devoted a considerable amount of time to the discussion of lower rates on a world wide basis, and members of I.A.T.A. were unanimous in their desire to be of greater service to the public and to make their facilities available to an expanding market. The public demand for a cheaper air transport, in addition to maintaining the present standards of service, could not be ignored, Mr. Lipscomb said. The aims of the Association are to develop a pattern which will be attractive not only to travellers flying for business purposes but also to tourists and holiday-makers who, having only a short while at their disposal, must travel as rapidly and as economically as possible. In this connection Mr. Lipscomb referred to a speech which had previously been made by Sir William Hildred, Director General of I.A.T.A., who held that air transport should be available for the holiday travel of those of moderate means, and that airlines would wish to make this possible at the earliest opportunity because it would benefit operators, the individual travellers and the peoples of the countries to which they were flying. Among the 90 airline executives present at Bermuda were Mr. P. C. F. Lawton, B.E.A., Chairman of Traffic Conference No. 2, and Mr. C. W. Nielson of Qantas, Chairman of Traffic Conference No. 3.

AIRPORT TRAFFIC IN OCTOBER

MINISTRY of Civil Aviation statistics for October show that Northolt was the busiest airport during the month, handling 43,846 scheduled passengers compared with 33,387 scheduled passengers at London Airport. Of the 1,358 scheduled aircraft movements 923 were by U.K. operators and 435 by foreign operators. At London Airport 964 scheduled aircraft movements were made up of 198 by U.K. operators and 766 by foreign operators.

	All aircraft movements		Scheduled movements		Scheduled passengers
	Arr	Dep	Arr	Dep	
Aberdeen (Dyce) ...	770	770	155	153	—*
Belfast (Nutts Corner) ...	891	891	252	252	7,322
Birmingham (Elmdon) ...	963	965	0	0	—*
Blackpool (Squire's Gate)	1,022	1,022	65	65	—*
Bovingdon	488	492	19	19	—†
Cardiff (Pengam Moors) ...	376	377	127	127	827
Croydon	848	853	37	37	1,170
Edinburgh (Turnhouse) ..	568	567	102	102	1,919
Gatwick	468	465	0	0	—†
Hurn	783	781	5	4	18
Isle of Man (Ronaldsway)..	339	339	180	180	3,719
Liverpool (Speke) ..	794	802	184	184	5,241
London Airport	1,424	1,426	964	977	33,387
Manchester (Ringway) ...	870	868	207	211	4,206
Northolt	1,702	1,695	1,358	1,353	43,846
Nottingham (Tollerton) ...	482	482	0	0	—*
Prestwick	577	574	312	302	3,058
Renfrew	423	426	349	350	8,667
Southampton (Eastleigh)...	1,227	1,225	137	136	2,612
Southampton Water ...	330	330	35	38	1,202
Weston-super-Mare ...	527	530	127	127	—*
Yeadon	736	733	1	1	—*

* *Non-Customs airports.* † *M.C.A. Returns not available.*

AMBASSADOR TRIALS AT MAXIMUM WEIGHT

THE first prototype of the Airspeed Ambassador was on November 17th flown at a weight of 52,000 lb. Although originally designed for much lower weights the first prototype was used for this test since the second prototype, though desinged for a higher all-up weight, is not equipped with means of jettisoning ballast. The weight therefore represented a considerable overload for the first prototype aircraft. On these trials the load was increased in four successive increments, the aircraft being first flown from the grass runway at Christchurch and later from the short (1,300 yd) runway at the

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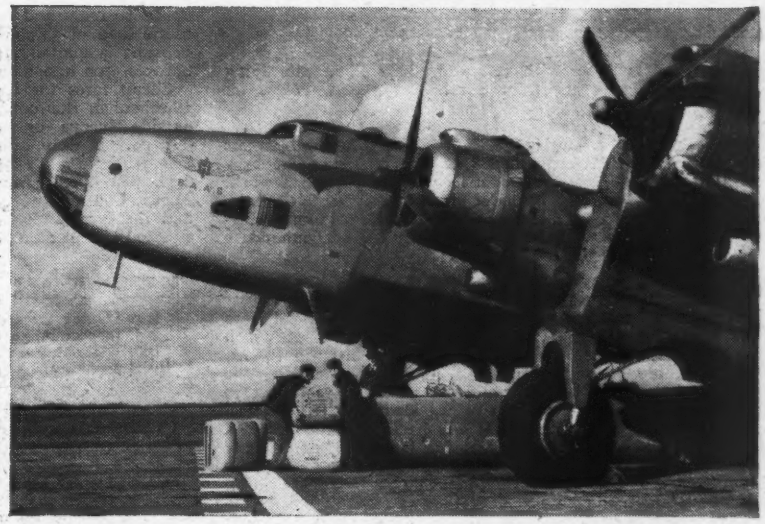
R.A.F. Station at Beaulieu. On the final full load take-off the end of the runway was crossed at a height of 70ft following a run of some 900 yards in a 10 m.p.h. wind. These figures were fairly close to those estimated and Airspeeds are especially pleased with them in view of the fact that the total take-off power available from the particular development engines used in the first prototype (Bristol Centaurus 631s) is only 4,900 b.h.p. whereas the production 661 power plants will give a total of 5,400 b.h.p.

The Ambassador was landed at a weight of 50,000 lb, the maximum permissible for landing and came to rest in about half the length of the runway. Behaviour of the aircraft in the air was satisfactory and no aerodynamic or other differences were noted by Mr. Errington. At each successive weight up to the maximum the aircraft was stalled with the flaps in three different settings and the characteristics were found to be docile with no noticeable change from the good stalling behaviour at lighter loadings. The aircraft flew on these tests with full normal fuel tanks—1,000 gallons—and the weight was made up to the maximum with sandbags and water ballast, part of which could be jettisoned to bring the weight down to within the limits prescribed for landing after the final take-off test at maximum load.



BLANKETS FOR REFUGEES: Part of a consignment of 180,000 blankets, which are being sent as a gift from the Iraq Petroleum Co. for refugees in Palestine, being loaded into the freight pannier of a British American Air Services' Halton at Bovingdon.

AIRCRAFT IMPORTS AND EXPORTS DURING OCTOBER

IN the Trade and Navigation Accounts for October, 1948, printed by the Stationery Office, comparative figures for exports and imports of aircraft, aero engines and equipment for October, 1947 and 1948, are published, together with the figures comparing the first ten months of 1948 with the first ten months of the preceding year.

Imports of complete aircraft during October, 1948, totalled seven, valued at £71,988, which, together with parts worth £524,488 which were imported during the month, brought the total value for the first ten months of 1948 up to £2,185,991 for aircraft and £2,428,199 for parts. Comparing these figures with those for the first ten months of 1947 a substantial increase can be noted; the figures were £1,089,659 for complete aircraft imported and for parts £1,464,566.

Aircraft export figures in October, 1948, were less than in the same month of 1947, 82 complete aircraft, worth £1,076,878, having been exported during October, 1948. During the corresponding period of 1947, 171 complete aircraft were exported. The October, 1948, exports of aircraft brought the total for the first ten months of 1948 up to 900 machines, valued at £11,654,493. Of the 82 aircraft 16 were exported to Belgium, 26 to the Argentine Republic, 6 to India and Pakistan, and 6 to Sweden. Other recipients were Eire 2, Union of South Africa 1, New Zealand 2, Norway 3, Denmark 3, France 1, Switzerland 1 and Portugal 1.

Exports of aero engines were lower in October, 1948, than they were in October, 1947, the comparative figures being 92 and 175. The value of these aero engine exports during October was £328,402, which made up the total for the first ten months of 1948 to £2,625,159. In October, 1947, however, the value of aero engine exports was £461,401, which made the value of exports during the first ten months of 1947 up to £3,062,908.

Figures for rubber tyres exported up to the end of October, 1948, were valued at £165,365, a notable increase over the figure of £60,013 recorded for the same period of 1947. The October totals for 1948 and 1947 were £15,353 and £3,324 respectively. Miscellaneous spares, components, etc., exported during the month under review were valued at £546,408, which was slightly lower than the previous figure of £663,631. Again comparing the totals for the first ten months of the two years the figures show an increase in 1948.

BREVITIES

SIR MILES THOMAS, deputy chairman of B.O.A.C., who reached New York on November 19th was due to return there on November 23rd after a visit to the West Indies. He was expected to return to London about December 1st. Sir Miles has been studying B.O.A.C. operations in the dollar-earning area.

* * *

The Lancastrian of Qantas Empire Airways surveying the route between Australia and Johannesburg via the Cocos Islands, Mauritius and Reunion Islands, referred to in *Flight*, November 18th, landed at Johannesburg only one minute late after its 8,500-mile trip.

* * *

Using ordinary recognized airlines Mr. Leif Hendil, of Copenhagen, recently completed a flight round the world within a week, the time taken for the complete journey being six days 21 hours 15 minutes. Starting from Kastrup his route lay through Amsterdam, Cairo, Basra, Karachi, Calcutta, Bangkok, Shanghai, Tokyo, Anchorage, Gander and Prestwick. He travelled by three airlines, namely K.L.M., N.W.A. and S.A.S. Mr. Hendil was not out to break any records but to test punctuality of international air transport.

* * *

No Aer Lingus services will operate on Christmas Day or Boxing Day this year. Among other extra services which are being arranged to meet the estimated holiday passenger demands both before and after Christmas are eight round-trip services to be operated on the Dublin-London route on December 23rd and seven return services on December 24th. This will bring frequencies on those days almost up to peak summer standards. On the Liverpool and Manchester routes two extra return services will be operated on December 23rd and 24th.

* * *

Lydda airport was reopened on November 24th for civilian air traffic after having been out of use for eight months. The airport was re-opened by Mr. D. Remez, Israel Minister for Communications, who said that Lydda would be the most important Israeli airport.

* * *

Following the announcement that Australian National Airways had taken over a half share in the Ceylon Government Airways, in *Flight*, November 18th, Col. Sir John Kotelowala, the Ceylon Minister of Transport, will lead a delegation from Ceylon to Melbourne on December 5th to negotiate an air traffic agreement with Australia. Under this agreement new services between Australia and Britain are planned. The Deputy Secretary of the Ceylon Treasury, Mr. T. D. Pereira, will accompany the Minister of Transport for the negotiations.

* * *

Beginning on November 20th the B.O.A.C. flying boat service to Japan was extended as far as Tokyo; previously the service ended at Iwakuni in the zone of the British Commonwealth Occupation Force, necessitating a 24-hour train journey to the capital. The service operates once weekly in each

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direction and is flown with 22-seater Short Plymouth flying boats, departures being from Southampton and Tokyo on Saturdays.

* * *

During the war a few Italian Piaggio P.108 heavy bombers saw service, and it is learned that the company are now modifying this military design for freight and passenger work. The prototype P.108T-2 is under construction at the Finale-Legure plant and it is to be powered by four Pratt and Whitney R-2000 engines. The passenger version is to accommodate up to 60 seats and the freight version is expected to have a useful load of 31,000 lb. A cruising speed of 260 m.p.h. at 11,000ft is quoted, and, according to load, the range varies between 700 and 2,100 miles.

Cheap fares for children between the ages of 12 and 18 at school in this country who visit their parents in countries outside Europe (or vice versa) at the recognized annual holiday periods were introduced by K.L.M. on November 22nd. The reduction, which will amount to half the adult return fare, will operate on services to the Middle and Far East, North, Central and South Africa, North and South America and the West Indies. Return journeys may be made within a period of four months.

R.Ae.C. MAINTENANCE SCHEDULES FOR LIGHT AIRCRAFT

THE first of the Maintenance Schedules in the Royal Aero Club's light aircraft servicing scheme, details of which were given in *Flight*, May 6th, and subsequently in *Flight*, May 20th, are reproduced below. As reported earlier, the purpose of the scheme is to avoid the necessity of having to make an aircraft perfect once a year, when its C of A is renewed, in order to ensure that it will be safe at the end of a 12 months' period even if the intervening maintenance may have been small. As will be seen, the accompanying schedules comprise a monthly check, a six-monthly inspection (with an overriding maximum of 120 hours), a 12-monthly inspection and a three-yearly complete overhaul, now associated with the renewal of the C of A, with an overriding maximum of 300 hours. This first schedule applies to privately owned single-engine aircraft not exceeding a maximum total authorized weight of 3,500lb.

In order that private owners may receive the benefit of the General Maintenance Schedules R.Ae.C./1 and R.Ae.C./2 as early as possible, the Air Registration Board has agreed that the 12-monthly inspection to coincide with the renewal of the C of A may be applied as from June 1st, 1948 (a) in aircraft in respect of which the C of A was first issued on or after January 1st, 1948, and also (b) to any aircraft of which the C of A was last renewed on or after March 1st, 1948. The owner of a private aircraft in respect of which a C of A was issued prior to January 1st, 1948, or renewed prior to March 1st, 1948, will be able to apply the Maintenance Schedules immediately after the C of A is next renewed.

MONTHLY INSPECTION

Fuselage, Wings, Flaps and Tail Unit

A.1. Inspect externally for:—(a) damage; (b) deterioration; (c) corrosion; (d) condition and tension of bracing wires; (e) condition of struts; (f) effectiveness of drain-holes.

Landing Gear

A.2. Check for freedom of movements.

A.3. Check compression legs for correct filling, i.e., air, oil, etc., as appropriate.

A.4. Inspect for damage or corrosion.

A.5. Lubricate as required.

Controls (all essential services)

A.6. Expose (so far as normally detachable panels will allow) and inspect for:—(a) correct functioning; (b) freedom from corrosion; (c) cleanliness and adequate lubrication.

A.7. Check correct functioning of control surfaces and inspect for cleanliness and adequate lubrication of hinge points.

A.8. Inspect control surfaces for damage and for security of attachment points.

A.9. Check tension of control cables.

Propeller

A.10. Check propeller for condition and security of attachment.

Electrical

A.11. Check battery for condition and system for functioning.

Exhaust and Heater System

A.12. Check for condition and security.

Note.—When it is known that an aircraft will not fly during the month following the time at which a monthly inspection is due, only items 1, 4, 8 and 9 need be attended to. If, however, the conditions of storage and the effectiveness of the protective treatment of the aircraft are satisfactory none of the items need be attended to, but in either case the whole of the items must be attended to the following month.

SIX MONTHS' OR 120 HOURS' INSPECTION

(Whichever Occurs First)

Repeat Monthly Inspection.

Fuselage, Wings and Tail Unit

B.1. Remove such fairings as are necessary to inspect the wing root and tail unit attachments for security and corrosion.

B.2. Inspect internally (so far as normally detachable inspection panels will allow) for:—(a) damage; (b) deterioration; (c) corrosion; (d) condition and tension of bracing wires; (e) condition of struts.

Landing Gear

B.3. Remove wheels, inspect and lubricate bearings.

B.4. Inspect tyres externally.

B.5. Inspect brakes and brake gear and rectify if necessary.

B.6. Without dismantling, check components for wear and rectify if necessary.

Controls

B.7. Check control cables at guides and pulleys for wear and rectify if necessary.

Fuel and Oil Systems

B.8. Without removal, inspect tanks for condition and security.

B.9. Inspect pipe lines externally for condition and for security.

B.10. Inspect cocks for leakage.

B.11. Check contents gauges for functioning.

B.12. Remove drain plugs or open cocks on tanks to remove water, etc., and relock.

12 MONTHS' INSPECTION

(To Coincide with Renewal of Certificate of Airworthiness)

Repeat Monthly and Six-monthly inspections.

Instruments

C.1. Calibrate A.S.I. and altimeter, check other instruments on test flight.

Fuel and Oil Systems

C.2. At the discretion of A.R.B. surveyor pressure-test tanks and pipes.

C.3. Calibrate fuel contents gauge.

C.4. Check and record petrol flow.

Fuselage, Wings and Tail Unit

C.5. At the discretion of A.R.B. surveyor remove sample bolts for inspection.

Controls

C.6. Slip and inspect control cables, except that cables which do not pass over fairleads or pulleys need not be slipped.

C.7. At the discretion of A.R.B. surveyor remove sample attachment pins or bolts for inspection.

Landing Gear

C.8. At the discretion of A.R.B. surveyor remove tyres for internal inspection.

C.9. At the discretion of A.R.B. surveyor remove sample bolts for inspection.

General

C.10. At the discretion of A.R.B. surveyor re-weigh aircraft.

500-HOUR OR 3-YEAR INSPECTION

(Now associated with C. of A. renewal)

Note.—If 500 hours is up in between C. of A. period it would be economical for the C. of A. to be renewed.

Repeat Monthly, Six-monthly and Twelve-monthly inspections.

Fuselage, Wings, Tail Unit, Ailerons, Flaps, etc. (except built-in units).

D.1. Remove wings and tail plane and the fin at the discretion of A.R.B. surveyor.

D.2. Open up and inspect entire structure.

D.3. Remove and inspect fittings, bolts and pins, etc., where corrosion, wear or damage is suspected.

D.4. Make good such defects as are disclosed as a result of the above inspections.

Landing Gear

D.5. Completely dismantle, overhaul, refit.

Controls

D.6. Completely dismantle, clean, overhaul and refit.

D.7. Renew or make good any defects as a result of this inspection.

General

D.8. At discretion of A.R.B. surveyor proof-load safety belts and harness.

The engine, variable pitch airscrew (if fitted), accessories and blind flying instruments are to be overhauled at the periods approved by the A.R.B. in respect of the particular type of component. For engines the General Maintenance Schedule R.Ae.C./2 comprises five inspections, namely, before flight, after ten flying hours, minor, intermediate and major inspections. The schedule enumerates each item to be checked at the various inspections, and various types of engines are listed by the R.Ae.C., together with the item numbers of the inspection schedule applicable to each particular engine.

Their Majesties the King and Queen with one of their Viking aircraft.

A KING'S FLIGHT

Its Aircraft, Crews and Duties on a Royal Tour

THE announcement last week that for health reasons the King had been compelled to postpone indefinitely the proposed Royal Tour of Australia and New Zealand caused widespread concern and disappointment, and, in particular, came as a great blow to the men of the King's Flight who, well in advance of the *Vanguard*, were about to start on their long flight to Australia. Only a fortnight ago *Flight* visited R.A.F. Station Benson, near Oxford, where the King's Vikings are based, and heard the details of plans, routes and preparations from enthusiastic members of the air and ground crews. All arrangements had been completed for the part to be played by the Flight.

Captain of the King's Flight, A. Cdre. E. H. Fielden (left) with the Flight Commander W/C. E. W. Tacon.

In the late Spring of this year the Captain of the King's Flight, A. Cdre. E. H. Fielden, C.B., C.V.O., D.F.C., A.F.C., and the Flight Commander, W/C. E. W. Tacon, M.V.O., D.S.O., D.F.C., A.F.C., flew out to Australia and New Zealand to inspect the airfields to be used and their facilities. They returned well satisfied with what they had seen and, in fact, agreeably surprised at the high standard of many of the airfields.

The King's Flight was formed in 1936. A. Cdre. Fielden had until then been personal pilot to the Duke of Windsor. During the war, in 1941, the Flight formed the nucleus of No. 161 Bomber Squadron. In 1946 it was reconstituted with four Vikings, and Hoverfly helicopters were added shortly afterwards to maintain a daily mail service to Balmoral while the Royal Family were resident there. The daily mail flight by a Viking from London to Dyce, where the helicopter took over, was an important part of the training routine.

As a result of experience on the South African Royal Tour and because the Australian visit was to have taken almost twice as long and entailed about double the number of flying hours, it had been thought advisable to increase the number of ground crew and to add a fifth Viking to the air fleet. Only very minor modifications have been made to the aircraft since the African flight. The normal aircraft ground crew numbering twenty, i.e., four per aircraft, would have travelled out by Viking. In Africa it was found that the quick change of climate led to

Five captains of aircraft who pilot the King's Vikings are: (left to right) F/L. S. N. Sloan; F/L. E. B. Trubshaw: S/L. H. A. Nash; S/L. R. H. F. Payne; and F/L. A. J. Lee.

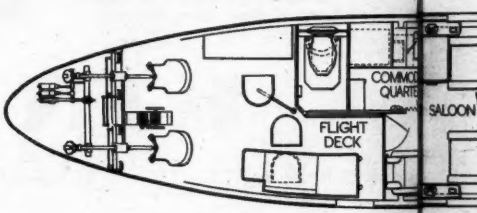
several cases of temporary sickness among the crews and that the job of servicing and keeping the aircraft spotless inside and out was almost more than they could manage. The outside surfaces of the two Royal transports, in particular, are kept in dazzling condition. In addition, therefore, a complete spare crew would have travelled to Australia by air. Air headquarters were to have been set up at Richmond, near Sydney, N.S.W., and at Whenapai in New Zealand.

It is well known that the Royal Family were looking forward very

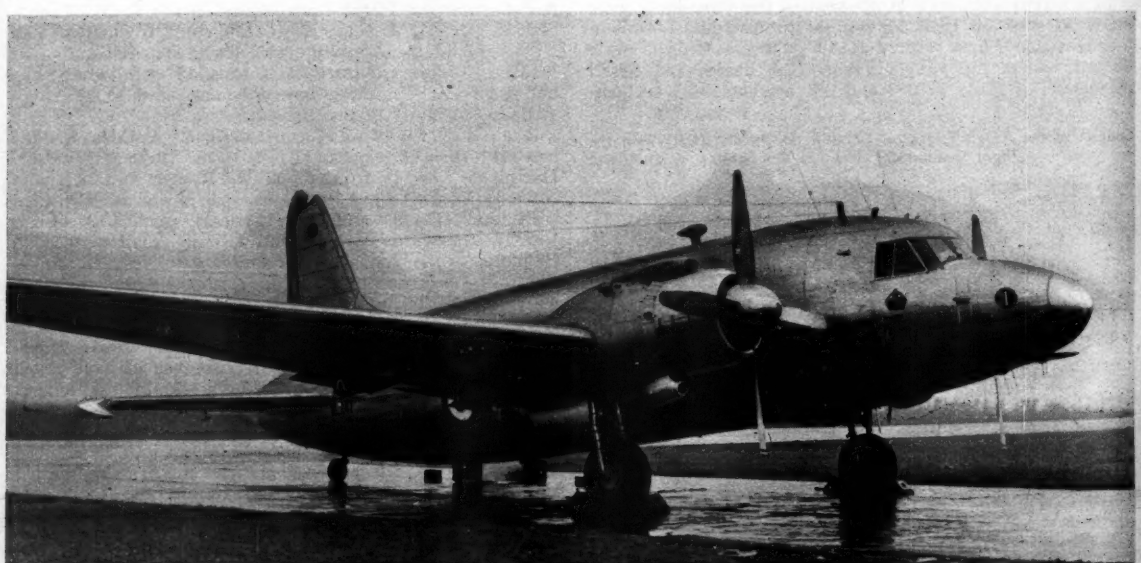
THE KING'S FLIGHT . . .

much to their visit, and everyone hopes that the King will be well enough to undertake the Tour at a later date. If this is so, much of the work and planning of the King's Flight should be at once applicable to the new arrangements.

Of the five Vikings in the King's Flight two are the machines used by their Majesties, fitted out to Royal standards and having seats for eight. The Royal cabins in each aircraft seat four. The interior appointments were described and illustrated in colour in *Flight* of February 13th, 1947.

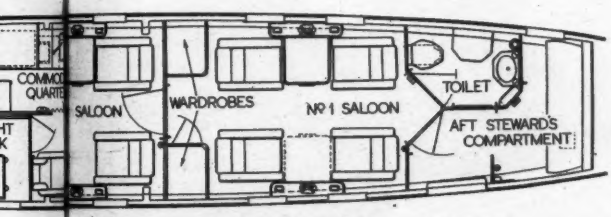


Royal Vikings—the Queen's aircraft is illustrated below—are planned to accommodate eight passengers, four being in the main No. 1 saloon.



King's Aircraft: S/Ldr. H. A. Nash, A.F.C.	Co-pilot
F/Lt. D. Fowkes	Navigator
F/Lt. L. G. A. Reed, M.V.O., D.F.C.	Signaller
F/Lt. K. C. Hampson, D.F.C.	Engineer
Queen's Aircraft: S/Ldr. H. F. Payne, M.V.O., A.F.C.	Pilot
F/Lt. A. Browne	Navigator
F/Lt. F. Myers, A.F.M.	Signaller
F/Lt. J. F. W. Yates, D.F.C.	Engineer
Flying Workshop: F/Lt. E. B. Trubshaw	Pilot
F/Lt. E. Brewin	Navigator
F/Lt. P. H. McKenna, D.F.M.	Signaller
F/Lt. E. Yates	Engineer

A seat in the Royal saloon.



(Below) Interior of the workshop Viking.

Staff Aircraft (1): F/Lt. A. J. Lee	Pilot
F/Lt. J. Higgins	Navigator
F/Lt. K. Gamble	Signaller
E/Lt. H. J. Redding	Engineer
Staff Aircraft (2): F/Lt. S. N. Sloan, D.F.C., C.G.M.	Pilot
F/Lt. M. E. H. Dawson, D.F.C., D.F.M.	Navigator
F/Lt. M. P. Davies	Signaller
F/Lt. L. D. Pope, D.F.C.	Engineer
Administrative Staff:	
S/Ldr. G. A. Pearson, M.V.O.	Flight Engineer Officers
F/Lt. T. Bussey, B.E.M.	Flight Engineer Officers
F/Lt. L. W. Denning	Secretarial and Equipment Officer
F/Lt. D. J. Rogers	Adjutant

In addition there are 60 airmen fitters, wireless mechanics, electricians, cooks, etc.

Two other aircraft of the Flight have cabins furnished in a similar manner to the B.E.A. Vikings, but with only twenty seats in pairs rather more widely spaced. The fifth machine is the flying workshop which is equipped to take work benches on the starboard side aft, with lamps and power points, and ahead of these a small parts store comprising transverse canvas partition carrying canvas pouches of various sizes, each drawn in at the top by elastic.

Five aircrews, each comprising 1st Pilot/Captain, Navigator, Radio Operator and Engineer, fly the Vikings. All have "A" qualifications; all with the exception of the Squadron Leader pilots of the King's and Queen's aircraft are Flight Lieutenants; and all are British. In addition to these twenty officers, the Air Commodore and the Flight Commander, who is a New Zealander, there are two engineer officers, an equipment officer and an adjutant.

The first Viking was to have left on November 29th, carrying, in addition to the crew, Brigadier W. Gwatkin, Assistant Comptroller of the Lord Chamberlain's office, and W/C. Lampey, R.A.A.F. liaison officer. The other four Vikings would have followed in January.

The aircraft were to fly out separately to avoid overtaxing accommodation, catering and transport facilities at many of the stopping points. The day-to-day itinerary

Pilot and co-pilot have an excellent view from the cockpit of the Viking. The Queen's aircraft is illustrated.

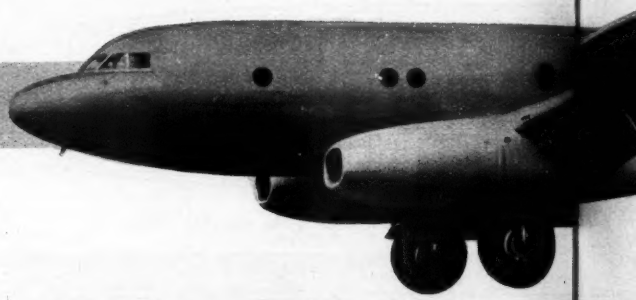
for the nine-day journey was: 1, Malta; 2, Habania; 3, rest; 4, Karachi; 5, Calcutta; 6, Singapore; 7, rest; 8, Darwin; 9, Richmond. Some ground crewmen and additional spares were to fly out in one or two Yorks.

Following experience in Africa, a flight plan for each Royal flight of this nature has now been worked out as follows:—One staff Viking leaves first carrying attendants, police, luggage, etc., to prepare the way. Twenty minutes later the first Royal aircraft takes off, followed after another five minutes by the second. Fifteen minutes later the staff Vikings follow, and, when included in the Flight, the servicing machine takes off last, twenty-five minutes after the rest. Princess Margaret would fly on some occasions with her father and on others with her mother.

The Royal Vikings with their two Bristol Hercules engines have crashproof tanks of 720 gal. capacity. The safe endurance at 200 m.p.h. is 6¼ hours. The estimated air distances involved in a Royal Tour of the Antipodes would be 4,345 miles in Australia and Tasmania; 1,170 miles in New Zealand. To this must be added about 26,000 miles out and return for aircrews. It would entail about 30 hours' flying by the Royal Family.

Paired power units, underslung and inboard, tend to accentuate the great span of the Tudor as it approaches to land.

AVRO TUDOR



AFTER its spectacular last-minute inclusion in the S.B.A.C. display, the Avro Tudor VIII research aircraft, with two pairs of Rolls-Royce Nene turbojets, has for the time being stepped out of the limelight and is about to commence the very important routine of research and development flying for which it was built. Naturally, such an aircraft is in great demand by departments of the companies responsible for its airframe and power units, and particularly by the M.o.S., who sponsored it.

For a week or two following its Farnborough appearance, the Tudor VIII underwent a thorough check-over in the Avro hangars at Manchester. At present it is completing calibration and other tests at Boscombe Down. Pilots who have taken the controls during its 30 or so hours in the air to date report very favourably on handling and performance and, incidentally, praise the silence and comfort of the cockpit. The authorities are somewhat concerned at the effect of the four, powerful, low-slung jets on runway surfaces. (The great clouds of smoke seen at times at Farnborough were caused by overheating of the tarmac runway surface and not, of course, by the Nenes.) It is understood that this effect is being watched at Boscombe.

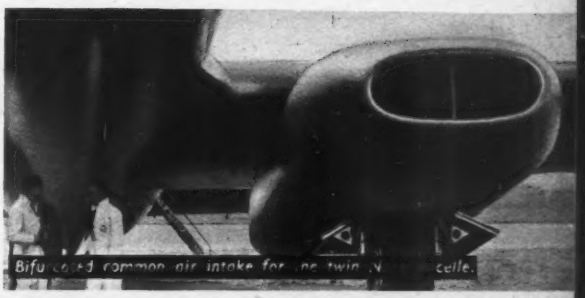
The production of the Tudor VIII was the joint work of the Avro company and the Rolls-Royce Research and Development department at Hucknall—the latter being responsible for the twin-power-plant nacelles and the undercarriage assemblies which fold up between the jet pipes.

A Ministry of Supply contract has been placed for the building of more Tudor VIIIs, but the number ordered has

An attractive blue and silver colour scheme has been designed for the Tudor VIII shown here in model form.

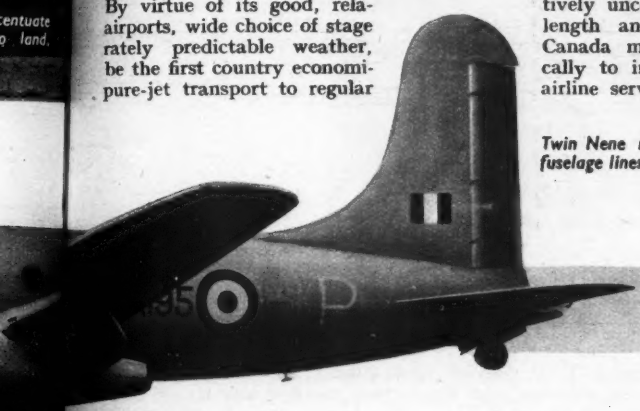
not been released. They will be supplied to appropriate research departments. Nenes are specified, but other turbojets could probably be installed without undue difficulty. The importance of this small fleet of research aircraft will be very great to both civil and military interests, for the Tudor VIIIs will be the first large fully-pressurized aircraft to become available for all kinds of high-altitude research. Previously turbojet machines capable of flying at high altitudes, have lacked space to accommodate all the equipment that could have been desirable. The Tudor VIIIs will offer greater comfort to observers and crew as well as increased pure-jet performance, and they are well suited to take over many duties from the earlier jet-cum-piston engine flying test beds.

On occasions the Tudor VIII has been inaccurately described as the first four-jet transport; obviously it can carry seating as fitted to the standard marks of Merlin-Tudors, but this is not the purpose for which it was produced. It is interesting to note, however, that the Canadian branch of the Avro company and the Canadian Government are together producing what will in all probability be the first airliner designed specifically for turbojets. In the 40-seater Avro C.102 T.C.A. should have a medium-range four-jet transport in advance of any other in the world. This aircraft is expected to cruise at 430 m.p.h. at 35,000ft on the power of four Rolls-Royce Derwents (4 by 3,500 lb thrust). The span is 98ft and the weight 52,500 lb. By virtue of its good, relatively uncongested airports, wide choice of stage length and accurately predictable weather, Canada may well be the first country economically to introduce pure-jet transport to regular airline service.


Bifurcated common air intake for the twin Nene nacelle.

By comparison the twin jet pipes seem widely separated.

Twin Nene nacelle form blends well with the fuselage lines of the Tudor VIII research aircraft.



VIII - - -

There is little doubt that the Avro Tudor VIII with its four Rolls-Royce Nenes is the most handsome of the Tudor range.

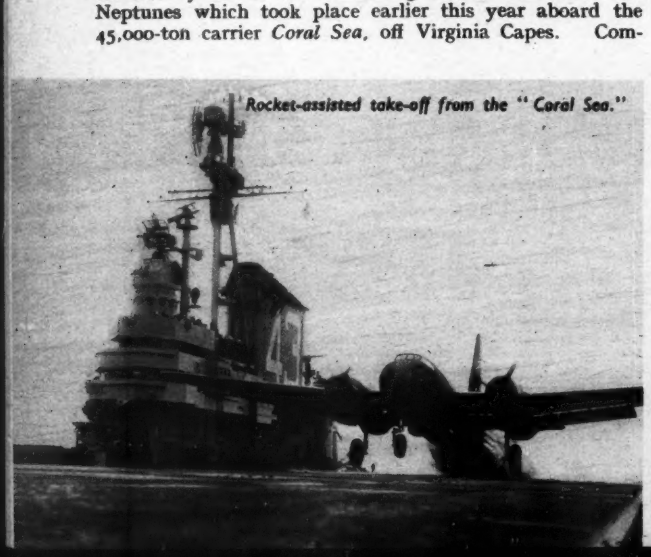
Three U.S. Navy Neptunes over the Mt. Fairweather Range, S.E. Alaska.

Neptunes in the News

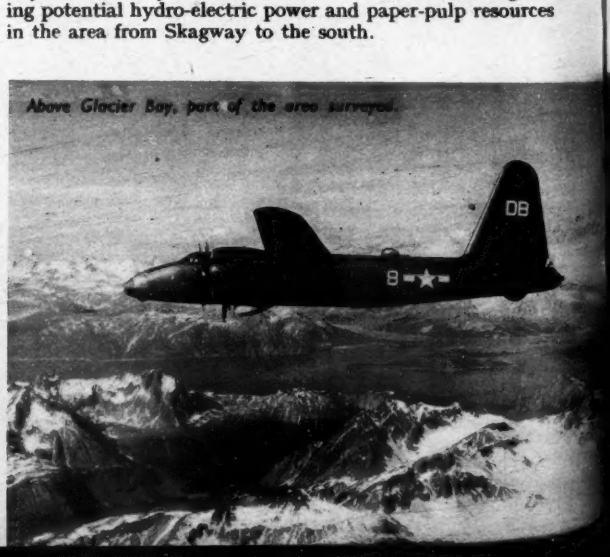
ON September 29th, 1946, a Lockheed P2V Neptune of the U.S. Navy, with the now famous name *Truculent Turtle* painted on its nose, took off from Perth in Western Australia, and landed at Columbus, Ohio, 55 hours 18 minutes later, setting up the present world's long-distance record of 11,236 miles. Since the enthusiastic acclaim naturally accorded that splendid achievement, relatively little has been heard of the Neptune, although it has meanwhile passed into squadron service with the U.S. Navy in increasing numbers, its emphatically proven long range being combined with other operational advantages to provide that Service with a most effective shore-base patrol bomber.

Some interesting information, however, has recently been released by the U.S.N. concerning take-off trials with two Neptunes which took place earlier this year aboard the 45,000-ton carrier *Coral Sea*, off Virginia Capes. Commander T. D. Davies, who piloted the *Turtle* on the record-breaking 1946 flight, took the first aircraft off the deck. Another link with the earlier occasion was provided by the use of a battery of fuselage-mounted rockets to assist take-off. Both Neptunes left the carrier safely, and afterwards landed at the Naval air station at Patuxent, Maryland. Now the largest aircraft to have taken off from a carrier, the Neptune has a wing span of 100ft, and its normal all-up weight is 58,000 lb.

Machines of the same type have been used lately on a very different type of operation. Six Neptunes of the U.S. Navy's Photographic Squadron I were engaged in an extensive survey of 30,000 square miles of Alaska during the summer months of this year, and with cameras specially modified by Lockheed, secured information regarding potential hydro-electric power and paper-pulp resources in the area from Skagway to the south.



Rocket-assisted take-off from the "Coral Sea."



Above Glacier Bay, part of the area surveyed.

A R.I.A.F. Dakota over Kashmir [illegible] supply-dropping mission.

Supply and Relief

THE widespread destruction among civil communities during the war by bombers must have left a bitter legacy of memories in almost every part of the world, and it is thus the more pleasing to record the more recent humanitarian work of transport aircraft in assisting, either by supplying or evacuating, areas which have become unwittingly involved in clashes of political outlook which have been so disturbing to world peace.

The aerial supply of the Berlin population is an outstanding example of the more merciful activities mentioned, as was the less-publicized, though equally worthy, transfer of 43,500 civilians and their baggage, a necessary factor in the division of India and Pakistan. During the two operations involved, which were organized by B.O.A.C., the aircraft taking part flew 1,110,000 miles, entirely without accident.

Two illustrations on this page depict two sides of a little-known conflict now taking place in the Kashmir province of North-Western India, where troops of the Indian Army are fighting Pakistan forces in a region where "icy winds and driven snow are turning brown faces grey." These climatic hardships are shared by the two million Kashmiris who have left their villages, and Dakotas of the R.I.A.F. are engaged in evacuating unfortunate refugees, while supplying Indian troops from the air. Despite the placid impression conveyed by the splendid aerial photograph above, the aircraft is occupied in this latter duty, while below are shown Kashmir tribespeople awaiting relief.

On their outward trips from Gatow, R.A.F. transports participating in the air-lift are reducing the risks of the oncoming winter for under-nourished Berlin children by flying them to parts of the British zone where living conditions will be easier.

Air evacuation of under-nourished German children.

Kashmir refugees are picked up by Dakota at Poonch airfield.

A few of the fifteen hundred cocooned B-29's at Davis-Monthan field, Tucson.

REST IN PEACE

—But Ready in Emergency : Cocooning Superforts

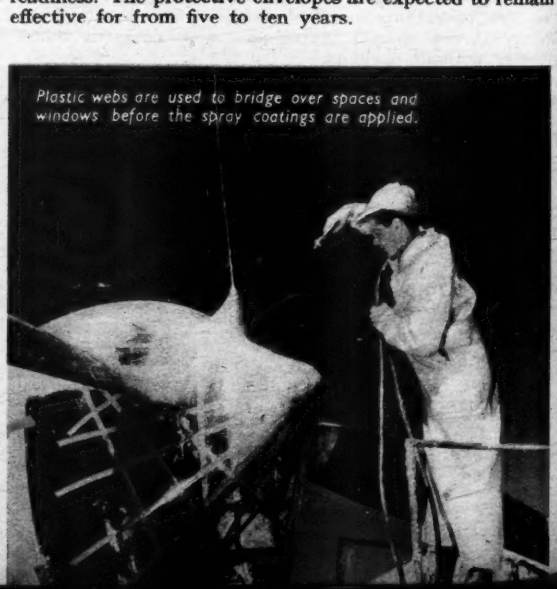
WASTAGE of weapons representing enormous sums of money is inevitable after a war, and aircraft by the thousands have been scrapped since the German and Japanese surrender. American Superfortress bombers which cost about £185,000 each were in full-scale production in 1945; some 2,800 had been produced, and the machine is still one of the best bombers in service in the world.

Following demobilization, all but a few hundred of the B-29s were parked and held in reserve, but the task of keeping them in condition was tremendous, and the cost in money and manpower prohibitive. Obviously, their size precluded the possibility of storage under cover. For this reason, research was made into methods of protection, and a very satisfactory and economical system was evolved at the Warner-Robins field, Georgia. Plastic envelopes, airtight and completely covering the aircraft, are sprayed on in five separate coats. Each coat is a different colour, so that there shall be no confusion about the number of applications, and the process starts with the protection and masking of all transparent panels. Openings are also "cobwebbed" before spraying starts. The fourth sprayed coating has an asphalt base which excludes all moisture, and the final coat is aluminium to reflect the sun's rays and avoid excessive heat inside the aircraft. The complete envelope is described as being seven times stronger than rawhide.

In case of emergency the plastic cocoons can be removed quickly, and cleaning-up, inspection and the refitting of the equipment removed before cocooning would not take long.

In all, 1,500 of the 2,800 total of Superforts are being cocooned. Four hundred others are in service, and they are backed by a 100 per cent reserve held in immediate readiness. The protective envelopes are expected to remain effective for from five to ten years.

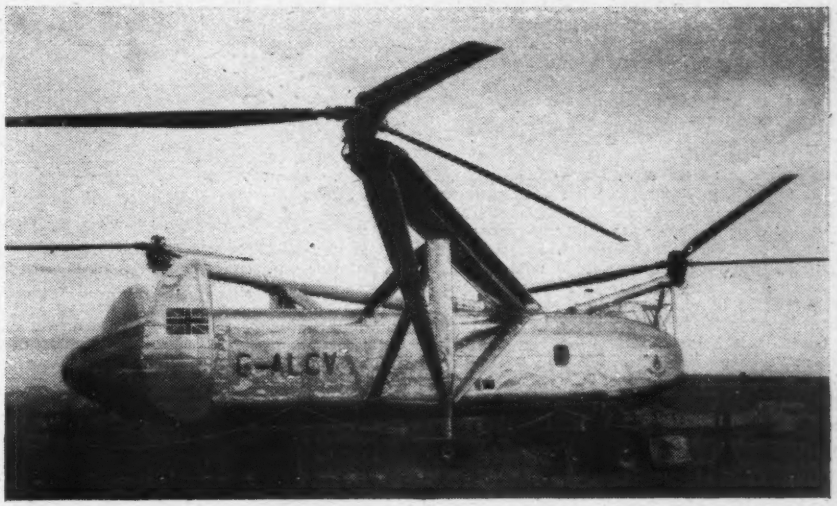
Covering a B-29 tail. The colour indicates that this is the second application, leaving three more coats for complete protection.



Plastic webs are used to bridge over spaces and windows before the spray coatings are applied.

Discussing the Helicopter

The Cierva W.11 "Air Horse" Described and Evaluated : Advantages and Disadvantages of Three Rotors



The Cierva W.11 "Air Horse" is powered by a Rolls-Royce Merlin engine. The all-up weight is 17,500 lb.

LAST week we dealt with four of the five papers read at the joint all-day meeting on November 20th of the Royal Aeronautical Society and the Helicopter Association of Great Britain. In the following pages we give a summary of the paper read by Mr. Shapiro, of the Cierva Autogiro Company's technical staff.

Mr. Shapiro recalled early schemes for multi-rotor helicopters, and said that by 1945 the Cierva company became convinced that neither the physical achievement of vertical flight nor the achievement of continuous operation could any longer be considered satisfactory aims. They were searching for a project which would offer economically sound commercial operation on a large scale. Such operation could only be envisaged by increasing the size of the helicopter. The Air Horse design arose primarily as an answer to the demand for large loads. It was realized that difficulties increased in proportion to rotor diameter, and it was thus natural to increase the number of rotors.

Three rotors were chosen because a body in space is determined by the position of three of its points, provided they are not in line. In the Air Horse the rotors have freely flapping blades, and the three rotors turn in the same direction, torque reaction being counteracted by horizontal thrust components, obtained by built-in tilt of the rotors. The rotors are arranged with the single rotor in front and two side by side at the back.

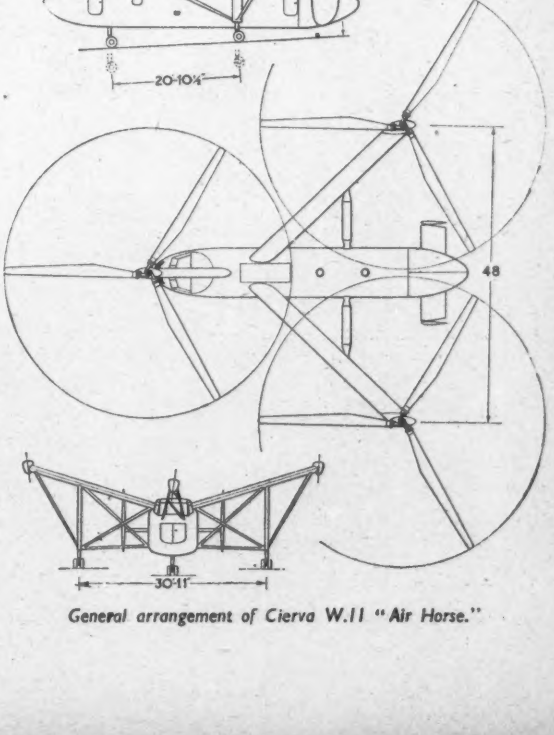
Control in pitch and roll is by lift couples obtained through differential application of collective pitch to the three rotors. For control in yaw, cyclic pitch variation in the fore-and-aft phase is applied differentially to the side-by-side rotors. The machine is fitted with an undercarriage having a stroke of five feet and capable of absorbing the shock of high rates of descent.

The airframe of the Air Horse is a semi-monocoque structure with outriggers carrying the rotors and undercarriage. The canopy-covered cockpit is in front, equipped with fully duplicated controls and all necessary instruments. Behind the cockpit is a small luggage compartment through which the crew enter the cockpit. The front undercarriage leg is attached to the fuselage frame at the rear of this compartment. Then comes the engine room, which contains, in addition to the engine and its accessories, the distribution gear box, the "control exchange" mechanism and its ancillary hydraulic equipment, and the fan and radiator unit. A fireproof bulkhead separates this section from the main load compartment, at present fitted for freight-carrying only. A tail section completes the streamlining of the fuselage. It is in hinged halves to give unobstructed access to the compartment. There is a fixed tailplane with adjustable fins at its ends.

Streamlined outrigger booms to carry the rotors and undercarriage are of semi-monocoque construction and streamline section to reduce drag at forward speed. The undercarriage legs, supplied by Lockheeds, comprise telescopic tubes, the outer of which carry the loads while the inner constitute the oleo-pneumatic shock absorber. Palmer wheels and tyres are fitted.

Power is supplied by a Rolls-Royce Merlin 24 with single-stage, two-speed supercharger. The cooling system layout is of shunt type and includes a light-alloy Marston radiator. The exhaust system is a specially developed "cross-over" manifold surrounded by a jacket through which cooling air is drawn by the ejector action of the exhaust gas. The coolant radiator and the oil coolers (including transmission oil coolers) receive a flow of air from a horizontally mounted variable-pitch fan drawing air from above and ejecting it downwards through the radiators.

The engine drives the distribution gears through its standard spur gear reduction and a clutch unit consisting of



General arrangement of Cierva W.11 "Air Horse."

Discussing the Helicopter . . . . .

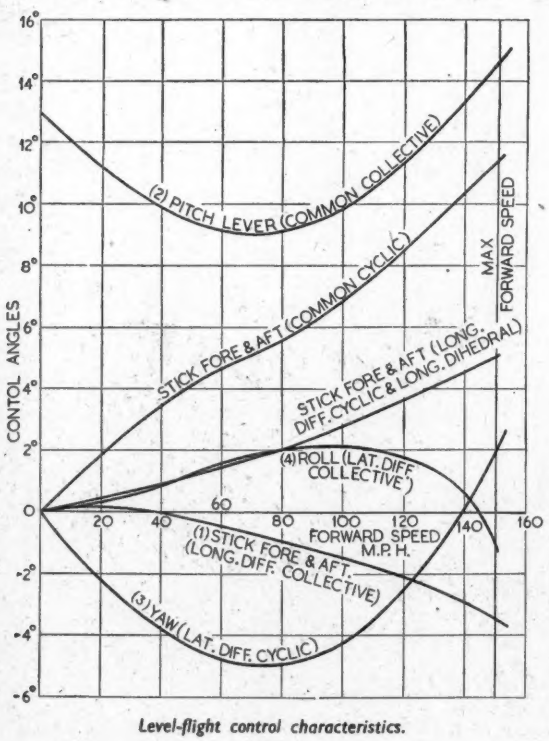
two parallel branches. One branch is a manually released, centrifugally loaded, multi-plate friction clutch with a roller-type freewheel in series. The other branch is an automatic, centrifugal clutch of the roller type, which engages when the rotor system reaches a certain speed of rotation, provided torque is transmitted from the engine. The friction clutch is released by a clutch lever operated by the pilot and engages provided the engine has attained a minimum speed of rotation. Through the friction clutch the rotor system is brought up to speed, and thereupon the roller clutch engages automatically. This latter constitutes its own freewheel. In the event of engine failure, the rotors remain permanently geared together. The clutch unit incorporates the rotor brake manipulated by the clutch release lever.

The distribution gears split the power without speed reduction into three branches of transmission shafting. The shafts run through the outriggers to connect the distribution gear box with the rotor gear boxes and consist of large-diameter aluminium alloy tubes fully protected against deformation of the structure by means of universal joints and flexible couplings. The rotor gear boxes contain two steps of speed reduction, of which the first is a set of straight bevel gears and the second is an epicyclic gear train having straight spur teeth. The gears were supplied by the E.N.V. Engineering Co.

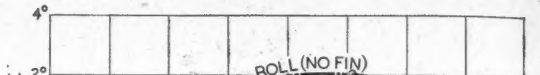
A hub spider is mounted on the epicyclic output shaft. It includes integral flapping pins which carry flapping links on ball and roller bearings. The flapping axes intersect the axis of rotation. The drag link is hinged through needle bearings on the drag pin, situated at five per cent of the blade radius, and carries the torsional articulation, which comprises one double-action, preloaded, large-diameter Timken taper roller bearing. The drag link is restrained in its action by hydraulic dampers.

Rotor blades are manufactured by H. Morris, of Glasgow, and are of all-wood construction but attached with light-alloy fittings, screwed to the spar. The main spar is of high-density, resin-bonded laminated wood. Pressure-moulded skins are checked into the main spar and cover the hollow trailing-edge portion, but are supported by longitudinal auxiliary spars. The blades are of N.A.C.A. 23015 profile. They are tapered in plan form and have appreciable twist.

The flying-control system is interesting, but is difficult to explain without illustrations, which are not available. It is capable of controlling the machine fully, but to improve its



Level-flight control characteristics.



Level-flight control charactistics. Fin controlled by rudder bar. Fin angle 2 x differential cyclic pitch angle.

flying qualities and extend its range of forward speeds it is intended to introduce further control connections, the effects of which were discussed by Mr. Shapiro.

At high speed in forward flight it becomes essential to reduce or suppress the flapping of the blades. This can be done by giving all rotors cyclic pitch control in the same sense and of approximately equal magnitude. The result will be a nearly complete suppression of flapping in level flight, as indicated by one of the diagrams.

Directional control in forward flight is by orientable fins controlled by a trimmer wheel in the cockpit. The control characteristics are shown in a graph. Stability characteristics of a three-rotor helicopter are greatly influenced by the amount of dihedral between the rotor discs. It has been found that negative dihedral contributes to dynamic stability when hovering, while stick-fixed stability in forward flight requires positive dihedral. Provision will be made for producing virtual differential tilt between the front rotor and the two rear rotors. Mr. Shapiro pointed out that the number of possible combinations is very large, and that the selected combination in the Air Horse has been evolved through a long process of elimination.

Control Characteristics

After this description of the Air Horse Mr. Shapiro turned to the subject of control. Control in roll and pitch is extremely powerful, and the control couples "pure" and not associated with horizontal forces until the aircraft has actually changed its attitude. Control in pitch and roll are produced by increments of lift and not by the lift itself, so that basic control functions are operative under all conditions of flight, without exception.

One advantage of the three-rotor layout emphasised by Mr. Shapiro was that it is not nearly so sensitive to c.g. location as is the single-rotor helicopter. In the Air Horse, he said, it can be as far as two feet in front of or behind the mean position, due to the very powerful pitching control.

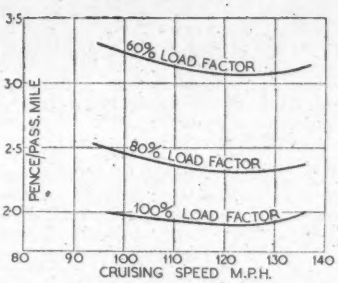
Next Mr. Shapiro turned his attention to criticisms likely to be advanced, such as complication, weight and drag penalties. The approach was through the point of view of the operator selling helicopter communication, and the overriding aim "to provide helicopter transport services at low cost in terms of pence per ton-mile or passenger-mile at a speed leaving a substantial margin compared with ground transport, accompanied by the highest possible safety."

Once commercial operation was considered, Mr. Shapiro said, the criticism of complication lost its significance as an independent yardstick. It must be expressible in terms of first cost and maintenance. He believed that multiplication of components would tend to cheapen manufacture. Final judgment of maintenance would have to await practical experience. The good accessibility in the Air Horse would help to outweigh the disadvantages of multiplication.

There then remained to examine the three-rotor configuration from the point of view of performance in terms of transport economics. The evaluation was divided into two main considerations: the three-rotor configuration and the long-travel undercarriage.

The first question was: were the advantages of the three-rotor helicopter accompanied by weight and drag penalties leading to increased cost of helicopter transport? From the safety point of view, there could be no doubt that the powerful control, the stability, and the wide undercarriage base with high energy absorption, combined to make the three-rotor the safest type under development. The next step to improved safety lay in twin-engined power plants, and the Cierva firm had in the design stage such a type, to be powered by two

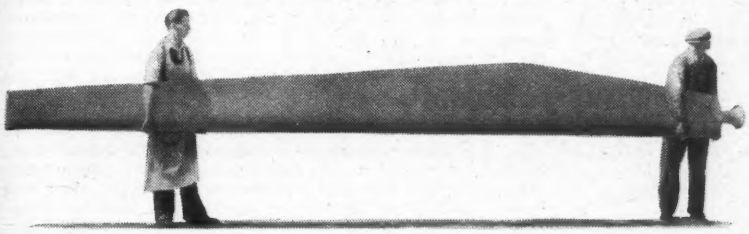
Merlins. Mr. Shapiro thought that the twin-engined version would be used in future for all but special duties. His investigations of economic efficiency was, therefore, based on the twin-engined machine. Other contributions to safety, which were being developed, included automatic limitation of rotor r.p.m. and automatic conversion to autorotation.



Air Horse passenger carrier. All-up weight 17,500 lb. Stage length 100 miles. Utilization 2,400 hours per annum.

Having ensured maximum safety, the next subject for discussion was speed. The value of speed to the customer increased in large steps and not gradually. As an example, a reduction of travelling time to the Midlands from 2½ hours to 50 minutes allowed a full day's work to be done, but a further reduction of 25 minutes was of little consequence. All helicopters under development had about the same cruising speed, 115 m.p.h., and the Air Horse promised to attain this with economical cruising power. He thought 110 m.p.h. a minimum for passenger transport.

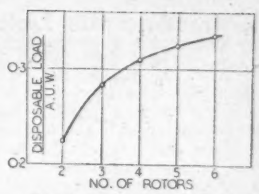
In examining costs, Mr. Shapiro confined himself to direct costs. The helicopter scored in the matter of indirect costs by virtue of the simplicity of ground installations. Aspects dealt with were: effect of size, configuration, and design parameters.



The all-wood blades for the Air Horse were manufactured by H. Morris of Glasgow. They have a length of 21ft, and each blade weighs 125 lb. Some 1,500 pieces of wood go into the construction of one moulded blade.

A graph, published herewith, showed that up to the size of the Air Horse and beyond, the effect of size on cost was predominant. It includes the twin-engined Air Horse. Size had a far less pronounced effect on percentage of disposable load.

After admitting that comparisons based on hypothetical helicopters of equal size but different configurations were built on slender foundations, Mr Shapiro simplified the problem of effect of configuration by concentrating on percentage disposable load. For machines of equal size that criterion almost entirely determined the cost per ton-mile when speed, utilization and load were assumed constant. Comparisons which expressed real trends could be made between helicopters with different numbers of rotors. One of the illustrations shows that a very considerable improvement results from increasing the number from two to three. He thought the best alternative system, the tandem machine, was only marginally better than the side-by-side twin-rotor machine, and therefore probably inferior to the three-rotor. The safety feature of rotors on outriggers was actually found to be more economical in weight than the best alternative. Aerodynamic interference between rotors in forward flight had been found negligible in the Air Horse. Interference in hovering, which would determine the aerodynamic lifting efficiency, still had to be measured full scale for reliable results.

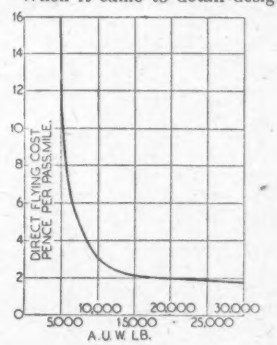


Variation of disposable load/all-up weight ratio with number of rotors. Power 2,500 h.p. Tip speed 550 ft/sec. Disc loading 3.3. Minimum solidity and minimum undercarriage travel.

Turning to the choice of parameters, Mr. Shapiro explained that the design approach was made in the following steps: Definition of permissible all-up weight; determination of truly independent parameters; sub-division of component weights into groups depending on individual parameters and their combinations.

All-up weight was limited to that which could be lifted vertically at a rate of 6 ft/sec by maximum engine power. Once the configuration had been settled and the power unit chosen, there were four major design parameters: Disc loading; tip speed; blade solidity; and undercarriage stroke. The only two truly independent parameters were disc loading and tip speed. The effect of disc loading flattened out and remained stationary over a considerable region. Air Horse disc loadings were near the maximum, but solidity was adjusted to avoid tip stall, and undercarriage stroke increased to absorb the energy of unaided vertical descent without power. Low disc loadings meant low forward speeds owing to power limitations, until, at disc loading of around 3, power no longer limited forward speed.

When it came to detail design, Mr. Shapiro stated that the value of weight-saving in a helicopter was greater than in a fixed-wing machine. On a basis of 2,400 hours' utilization, one pound of weight in the Air Horse was worth £25 in selling price. Summarizing this part of the Paper, Mr. Shapiro said that the Air Horse constituted a most important advance in economic efficiency due to its size, made possible by multiplication of rotors. The three-rotor configuration compared favourably with the best alternatives, and its many advantages were not bought at a sacrifice in economics. The Air Horse represented a choice of design parameters approaching the optimum in all but tip speed.



Direct flying costs of passenger-carrying helicopters. Stage length about 100 miles. Load factor 100 per cent. Utilization 2,400 hours per annum.

One important feature of the Cierva Air Horse is the long-travel undercarriage. Mr. Shapiro explained in considerable detail the reasons and arguments which have led to its adoption in preference to a more orthodox type. The rate of vertical descent of the machine was estimated at 41ft/sec, so that the energy absorption was approximately 12 times that corresponding to minimum A.R.B. requirements.

It was considered in planning the design that a feature such as the ability to make an emergency landing without demanding great skill of the pilot was preferable from a safety point

CIERVA W.11 PRINCIPAL DATA

All-up weight	17,500 lb
Empty weight (freight carrier)	11,870 lb

Rotors

Number	3
Diameter	47ft
Number of blades per rotor	3
Nominal solidity	0.0598
Nominal twist	11 deg 45 min
Nominal taper	2.584 : 1
Blade profile	N.A.C.A. 23015
Nominal r.p.m.	219.5

Performance

Max. rate of vertical climb I.C.A.N. Sea Level conditions—900ft/min.
Level flight speed for max. continuous power I.C.A.N. Sea Level conditions—125 m.p.h.

Engine

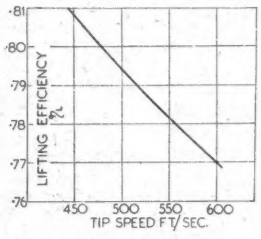
1 Rolls-Royce Merlin Mk.24. Single stage two speed supercharger. Gear ratios: 8.15 : 1 and 9.49 : 1.

	Boost	R.P.M.	I.C.A.N. Sea Level h.p.
Max. power (5 min)	+18	2,850	1,620
Climb power (1 hour)	+12	2,850	1,290
Max. continuous power	+ 9	2,850	1,120

Discussing the Helicopter . . . . .

of view. It was pointed out that loss of power occurs most often just after take-off, when there is no time for the pilot to carry out the required landing manœuvre. Apart from using maximum r.p.m., the ordinary take-off and climb should be inclined and into wind, which limited the main advantage of the helicopter: all-weather operation from strictly confined spaces. Another advantage of the long-travel undercarriage was that it made possible a reduction in operating cost through the simplification of ground installations.

To substitute kinetic energy for undercarriage absorption, it was necessary to provide enough kinetic energy for take-off and landing. In practice, the available kinetic energy in the rotor must be a multiple of the kinetic energy of the machine in vertical descent. The factor ought to be about five. In a three-rotor machine a factor of three might be expected. To obtain the missing 66 per cent, either tip speed could be increased by 30 per cent, keeping solidity constant, or blade inertia could be increased by 66 per cent, keeping tip speed constant. The former would reduce lifting efficiency by four per cent, as shown in the graph. The second would add at least 6 per cent to the empty weight. In the Air Horse the weight of the complete undercarriage group was less than 6 per cent of the all-up weight. Not more than half of that would be saved if ordinary undercarriage requirements only were fulfilled. The geometry of the Air Horse is such that the leg is a separate unit from the structural components of the undercarriage. The weight of the three shock-absorber units is only 1½ per cent of the all-up weight.



Variation of lifting efficiency with tip speed. Tapered twisted blade. Disc loading 3.5 lb/sq ft. Nominal solidity 0.05.

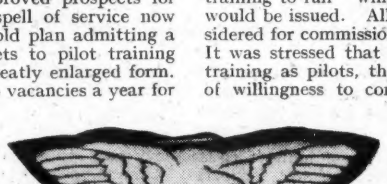
As for the potentialities of the Air Horse in civil air transport, Mr. Shapiro quoted figures of disposable load as 32 per cent for the freighter version and 27 per cent for the passenger machine. These figures might drop a little owing to additional operational equipment, but they compared with 28 per cent for the Airspeed Ambassador, a highly developed fixed-wing aircraft. It was expected that the twin-engined Air Horse would have a disposable load of 30 per cent in the passenger version and 35 per cent in the freighter, with full operational equipment of approximately 800 lb. Moreover, the twin-engined Air Horse would be able to carry its normal load at Nairobi, and, suitably equipped, would hover at 15,000ft over the highest passes of the tropical Andes. On European routes it would be possible to increase all-up weight and carry more payload.

Forward speed was confidently expected to be such that a 120 m.p.h. ground speed could be maintained against a 20 m.p.h. wind, when such was necessary to maintain schedules. Present estimates indicated a direct operating cost of 1.9 pence per passenger-mile for 100 per cent load factor, and a stage length of 100 miles. Overheads would probably increase this to rather less than 3.5 pence per passenger-mile, or a single fare London-Birmingham of 28s compared with 37s 9d by first-class rail. The journey would take 59 minutes, cruising at 116 m.p.h. London-Paris would cost £3 and the flight be made in two hours.

(The discussion will be reported next week.)

"NEW DEAL" FOR NATIONAL SERVICEMEN

IN the Air Council Room on November 25th, the Right Hon. Mr. Arthur Henderson, Secretary of State for Air, announced two new schemes offering improved prospects for R.A.F. conscripts during the 18-month spell of service now almost certain to become law. The year-old plan admitting a limited number of proficient A.T.C. cadets to pilot training during their service has now taken on a greatly enlarged form. Under the new conditions, there will be 300 vacancies a year for cadet pilots, of which 100 are reserved for members of the A.T.C., who may also compete for the remaining 200. There will also be provision for 500 National Servicemen to be commissioned in ground branches, which has hitherto occurred only in the case of professionally qualified entrants like doctors, dentists, technicians, and University graduates. By these two new schemes flying training or ground commissions would be given annually to some 800—or one in 60—National Service entrants.



The modified flying badge.

With Mr. Henderson was Air Marshal Sir Hugh Saunders, the Air Member for Personnel, who described the new schemes in greater detail. The first young men to benefit will register on December 14th, and must make an initial application to the registration officer if they wish to be considered for either pilot training or a ground commission. Having made this clear, the Air Marshal dealt with the two schemes separately. Prospective cadet pilots were required to be educated to School Certificate standard, and to be medically fit. Candidates who were accepted as suitable by the Combined Selection Centre at Hornchurch would, after recruit training, undergo a two-stage course (ground instruction and basic flying) before passing out as Pilot IVs. It was explained that as the time available would be insufficient for training to full "wings" standard, a "modified" flying badge would be issued. All National Service pilot cadets will be considered for commissions towards the end of their flying training. It was stressed that before National Servicemen could receive training as pilots, they would be required to sign a certificate of willingness to continue training with the R.A.F.V.R. or R.Aux.A.F. after their release from whole-time service.

Regarding the award of commissions in ground branches, the distribution will be in the following proportions: Equipment Branch—80; Secretarial Branch—150; Education Branch—250; R.A.F. Regiment—24. Only qualified teachers will be selected for the Education Branch. Officer cadets will receive training of six to eight months' duration, after which they will be commissioned and fully employed as officers. It is hoped that the introduction of these two schemes will encourage many National Servicemen to remain in the R.A.F., either as a career, or on short service commissions.

In reassurance of the 59 out of every 60 men to be called up for the R.A.F., who will not be eligible for commissions or flying training, both the Secretary of State for Air and Sir Hugh Saunders mentioned that, allowing for the proportions to be maintained in over 100 different trades, every effort is being made to allot recruits to the most useful and suitable trades, if not to those of their own choice; recruits, it was stated, often based their preference on scanty and misguided knowledge and were sometimes unsuited to the trades named.

IN MEMORIAM

A LARGE congregation attended the memorial service for A. Cdre. H. G. Brackley, held at St. Margaret's, Westminster, on November 24th. The Rev. W. G. de Lara Wilson officiated. British South American Airways Corporation was represented by Mr. J. W. Booth, chairman, and other members of the Board, officials and members of the staff. Representatives of British Overseas Airways Corporation included Sir William Cushion and Mr. Whitney Straight (Sir Harold Hartley is abroad). Air Chief Marshal Sir Frederick Bowhill, under whom A. Cdre. Brackley served both in Ceastal Command and in Transport Command, was among the many distinguished people who came to pay a last tribute; they included Lord Knollys, Lord Reith, Lord Nathan and Lord Pakenham.

In addition, there were representatives of the Air Ministry, the Royal Air Force, the National Joint Council for Civil Air Transport, the American Embassy, the Air League of the British Empire, the Guild of Air Pilots and Air Navigators, and many others.

Earlier in the day a requiem mass was celebrated at All Saints, Margaret Street, by the Rev. W. G. de Lara Wilson.

AIR FRANCES' FLEET

EXCLUDING aircraft undergoing modification or in use for training purposes, Air France's fleet in active use at the beginning of October comprised 13 Constellations, 17 DC-4s and C-54s, 28 DC-3s, 27 Languedoc 161s, 2 Catalinas, 15 AAC-1s (JU-52s), and 3 DH Dominies.

Corporations' Annual Reports

B.E.A. and B.S.A.A. Operations for the Year

(Continued from page 634)

IN the previous issue of *Flight*, dated November 25th (pp. 634-5), a brief summary of the Corporations' annual reports and a more detailed examination of the report of B.O.A.C. was published. Summaries of the reports of the other two Corporations are now given below. It should be pointed out that the comparative figures for B.E.A. losses during the year under review and for 1946-7 have been widely stated as £3,573,989 for 1947-8 and £2,157,937 for 1946-7, giving the impression that the annual loss has increased considerably. However, the 1946-7 figure represents the loss for only eight months' operation, the increase is, therefore, quite small.

B.E.A.

BECAUSE B.E.A. did not operate as a separate Corporation for the whole of the year 1946-47, a direct comparison of the figures for the first and second years cannot be made. The loss for the year under review amounted to £3,284,282. The Corporation believes that in the main, the first two of three objectives—safety, efficiency and economy—have been achieved, and that considerable progress has been made towards economic operation of services. As an indication of the trend the loss per ton-mile carried in 1947-48 was half that for 1946-47, and expenditure per revenue ton-mile decreased by 40 per cent and was continuing to fall. During the twelve months under review, B.E.A. carried 511,522 passengers, 2,284 tons of freight, and 1,391 tons of mail.

On October 6th, 1947, eight uneconomical services were withdrawn: London-Helsinki; Belfast-Carlisle-Newcastle; Isle of Man-Carlisle; Bristol-Southampton; Cardiff-Bristol; Prestwick-London; Cardiff-Weston-super-Mare; Prestwick-Belfast. Three other Island services were withdrawn for the winter months. As Vikings became available four new Continental services were introduced: London-Geneva; London-Nicosia (in conjunction with Cyprus Airways); London-Malta; Glasgow-Copenhagen. The last-named was subsequently withdrawn. Continental services were considerably more remunerative than the internal services, which are expected to show continued substantial losses.

There was an increase in the volume of traffic in 1947-48, and on the Continental routes comparisons of corresponding periods are as follows:—

	1946-7	1947-8	Percentage increase or decrease
No. of passengers carried	58,618	99,514	+69.8
Tons of freight and excess baggage carried	661	1,481	+124.1
Tons of mail carried	414	389	−6.0
Load ton-miles performed	3,339,000	5,547,000	+66.1

There were also large increases in traffic on the internal routes, which were the direct responsibility of B.E.A., for practically the whole of 1947 and 1948.

	April 1946 to March 1947	April 1947 to March 1948	Percentage increase or decrease
No. of passengers carried	224,334	361,311	+61.1
Tons of freight and excess baggage carried	809	988	+22.1
Tons of mail carried	526	792	+50.6
Load ton-miles performed	2,433,000	4,137,000	+70.0

The overall load factor for the two years fell by 6.7 per cent, mainly as a result of the great increase in capacity offered, the use of which did not reach expectations. Regarding fares, in order to bring Continental fares more into line with route costs, 5 to 10 per cent increases were made on Paris, Mediterranean and Iberian routes. The average increase on internal fares, which are settled by B.E.A. with Ministry approval, was approximately 15 per cent. Monthly return fares at 15 per cent rebate were introduced, however, in addition to the existing 60-day return to 10 per cent. To increase the popularity of internal services the introduction of reduced fares to attract special classes of traffic is being considered.

In connection with the carriage of air mail, the Corporation regret that continued representations for higher rates on internal services have not been acceptable to the Post Office, and negotiations which have been carried on have so far been unsuccessful. Freight rates on internal air services have been high. With the introduction of Dakotas, however, additional freight capacity became available, and a decrease in rates averaging 13 per cent was introduced in February this year.

Services in the past year have been mainly operated by Vikings, Dominies and Dakotas, while two uneconomical types, Avro XIXs and Jupiters, had been withdrawn. Technical difficulties experienced with the Vickers Viking are being progressively resolved, but the financial results, reflected in the high engineering costs, the difficulties which are inherent in the introduction of a new type. The licence to operate a Dakota fleet will probably extend on from 1950 to 1953, and it was proposed to equip the passenger versions with 28 seats in place of the present 21. The Dominie fleet had been reduced by approximately one half.

It has been decided to adopt the following new types: (a) the Miles Marathon, of which B.E.A. have agreed to accept seven if satisfactory terms can be arrived at; (b) the Ambassador, twenty of which are being negotiated for at present. An aircraft of simple design and construction to replace the Dominie is still being sought.

Satisfactory results of experimental carriage of mail with the aid of three Sikorsky S.51 and two Bell 47B3 helicopters are reported. A regularity of 96 per cent was achieved with Sikorsky aircraft over a 115-mile-long route with ten intermediate stops. The aircraft was seldom more than five minutes off schedule in spite of very high winds. The outcome of the successful experiments was that the G.P.O. made an arrangement with B.E.A. to carry out an experimental service with live mails in East Anglia during the summer months.

The two specially equipped Mosquitoes of the Gust Research Unit made frequent flights along various European routes at between 20,000 and 40,000ft. Cases of clear air turbulence had been encountered, but it was premature for clear-cut conclusions to be drawn. The cost of the experiments did not fall on B.E.A.

With the elimination of uneconomical types, the utilization of the Viking and Dakota was considerably increased. Comparative figures for the summers of 1947 and 1948 were 3.41 and 4.06 compared with 4.71 and 4.79 hours per day. One of the limiting factors continues to be the restricted maintenance facilities available at bases. The short stages of the internal routes mean relatively more time on the ground, and the average stage flight of the internal services is 103 miles as against 378 on the Continental services.

Aircraft maintenance and overhaul was the largest single item of expense absorbing approximately 40 per cent of the Corporation's gross revenue. This cost was excessive in relation to the revenue earned and could be ascribed to two main causes: the conditions under which the aircraft had to be serviced, and the types concerned. Jupiter aircraft, subsequently withdrawn, were included in the period under review, and their servicing costs were approximately three times what would be considered reasonable. Hercules engines fitted to the Viking had undergone overhauls at an average of 400 hours, whereas the fully-developed engine could be expected to run for 800 to 1,000 hours between overhauls.

The scale of landing fees had been unduly onerous on the internal services during the early part of the period, but since May 1st a new scale, giving substantial relief, had been in operation. It was regretted that no retrospective relief was possible. Analysis of the figure of £209,585 was as follows:

	Internal Services £	Continental Services £	Other Flights £	Total £
Fees payable at M.C.A. airports	106,780	34,455	—	141,235
Fees payable at airports not under M.C.A. control	38,800	29,491	59	68,350
	£145,580	£63,946	£59	£209,585

It is significant that Continental services landing fees were equivalent to 2.3 per cent of the total revenue, but on internal services they amounted to 12.9 per cent.

On June 30th, 1948, priorities arrangements came to a final

Corporations' Annual Report . . . . .

if tardy, end. The cost of unsold seats released too late to enable them to be resold has not been recoverable, and the amount involved is shown as £40,880.

Flying training carried out by Airways Training, Ltd., at Aldermaston cost £628,000, and a total of 2,973 students passed through the school. The training was carried out without major expenditure. The heavy cost of basic training is not likely to recur.

The policy of participating financially in airline companies operating on routes contiguous to the Corporation's, particularly the Mediterranean, has continued. Subsidiary and associated companies are as follows: Aer Lingus Teoranta (share of loss £228,000); Aerolinee Italiane Internazionali (Alitalia); Technical and Aeronautical Exploitations Co., Ltd. (T.A.E.); Gibraltar Airways, Ltd. (share of loss £7,817); Cyprus Airways, Ltd.; Airways Training, Ltd.; International Aeradio, Ltd. (share of loss £5,064); B.E.A. (Espana), Ltd.; Associated Airways Joint Committee Group; Guernsey Aero Club, Ltd. The Corporation proposes to acquire a financial interest in Channel Islands Airways, Ltd., and Allied Airways (Gandar Dower), Ltd.

Arrangements have been made with the Air Registration Board permitting the Corporation to overhaul the airframes of Vikings and Dakotas to its standard on a continuous basis throughout the year, thereby combining the normal major maintenance checks with the overhaul work. This should considerably cheapen engineering costs in coming years.

Announcements of intentions regarding redundancy had a disturbing effect on the morale of the entire staff, and in less than twelve months, 1,500 employees left for reasons other than redundancy. Most of the vacancies had been replaced. In October, 1947, the staff strength was 7,800, in March, 1948, it was 7,000, and at present it stands at 7,500, an overall reduction of 300.

Following discussions with B.A.L.P.A. in January and February, 1948, 94 pilots were declared redundant. Twenty-three accepted B.E.A.'s offer of employment as traffic officers, and the absorption of others into the R.A.F. has been taken up with the Air Ministry.

Three serious accidents occurred during the year, and these involved injuries to passengers and crew. The captain of one aircraft was killed. This was the only fatality to passengers or crew in nearly 12,000,000 aircraft miles involving the carriage of over half a million passengers.

New accommodation has been opened at Dorland Hall, Lower Regent Street—bookings, enquiries and sales; Stafford Court, Kensington—departures and arrivals; and property at Wembley.

B.S.A.A.

CONFIDENCE had been expressed in the last report in the ability of the Corporation to operate on a strictly commercial basis in competition with the airlines of the rest of the world. The conditions to which this statement was made subject are still far from being achieved. Restrictions continue to hamper the natural development of services, and to increase the cost of operations. It is stressed again that one of the pre-requisites of a successful airline operator is that the right aircraft must be available at the right time at the right price. This has not been true in the past, and the system of ordering aircraft from the M.o.S. which the Corporation found unsatisfactory, remains unchanged. The continued delay in delivery of the aircraft so badly needed, has not only prejudiced the Corporation during the year under review but will continue to affect results for some time ahead.

The following operational statistics include for the year 1946-47 a period of four months immediately preceding the establishment of the Corporation. Passenger ton miles flown in the period were 4,714,400 and freight ton miles 2,975,100.

	1947/48		1946/47	
	Total for year Scheduled Services	Percentage of total	Total for year	Percentage of total
Aircraft hours flown	23,820	94	13,715	90
Aircraft miles flown	4,795,800	94	2,776,700	90
Capacity ton miles flown	14,955,600	94	8,389,500	91
No. of passengers carried	13,772	—	6,937	—
Passenger miles flown	50,048,500	—	31,495,800	—
Passenger ton miles flown	4,714,400	53	2,966,800	61
Freight ton miles flown	2,975,100	34	1,010,800	21

The accounts of the Corporation for the year show an operating loss of £392,089 after allowing £312,449 for obsolescence and depreciation. This loss is further increased by items shown in the surplus and deficiency account, resulting in a net loss for the period of £421,481. The figures for direct and indirect labour costs have been the subject of more accurate costing than was possible in 1946-47.

Services operated by the Corporation were London to Buenos Aires (twice weekly in each direction); London to Rio de Janeiro (once weekly in each direction); London to Santiago (once weekly in each direction); London to Nassau (once weekly in each direction); London to Havana (once weekly in each direction); Kingston to Miami (three times weekly in each direction); Kingston to Nassau (three times weekly in each direction). Other activities included flight refuelling tests, charter flights and ferrying flights.

The Corporation continued to operate mainly with Lancastrian and York aircraft and three Tudors were delivered during the period covered by the report. In March of this year the Corporation owned 22 aircraft of six different types and had two Lancastrians on hire. The delay in delivery of the Tudors has resulted in serious loss of traffic and revenue. The decision to allocate the Tudor IV to B.S.A.A. is in accordance with the views of the Board, these aircraft being better suited to the routes operated by that Corporation than to the routes of the other Corporations. Even so, rather higher costs are likely to be incurred than would be the case with certain other types of aircraft operating in competition with them.

The policy of having aircraft fully written off at the end of their life has been maintained. Lancaster aircraft are now reserved for in full, Lancastrian aircraft will be covered by the end of the year, Yorks by July, 1949, and Tudors over five years from the date of purchase. Progress payments on aircraft under construction include £48,680 for de Havilland Comet aircraft and £57,975 on account for the acquisition and conversion of Vikings for British West Indian Airways Ltd.

The various subsidiary and associated companies of the Corporation are British West Indian Airways, Ltd.; British International Airlines, Ltd., and International Aeradio, Ltd.

Accidents during the period involved the York aircraft "Star Speed," resulting in the death of seven passengers; the Lancastrian "Star Dust," lost without trace in the Andes with six passengers and five crew on board; and the Tudor IV "Star Tiger," which disappeared without trace between the Azores and Bermuda with 25 passengers and six crew. Two other Lancastrians and a training Lancaster were written off without loss of life or serious casualty.

The total number of staff employed at home and abroad on March 31st, 1948, was 1,505, an increase of 474 during the twelve-month period. The increase was necessitated by the development of the Corporation's services, 150 staff being engaged locally overseas.

More time and material was devoted to training, particularly of operational staff in the course of the year, and this development of training arrangements has continued.

DOWTY EQUIPMENT REPORT

IN the Chairman's statement for the forthcoming annual general meeting of Dowty Equipment, Ltd., which is to be held on December 14th, Mr. G. H. Dowty announced that the order book of the company remained a record for peace time. It was expected that the aircraft expansion programme recently announced would result in a substantial increase of orders. Development work was proceeding on fuel pumps and fuel systems for gas turbines, power-operated flying controls and high-pressure air compressors. Dowty fuel pumps, standard on the D.H. Goblin and Ghost, were now being fitted by other manufacturers. Referring to Ashchurch Seals, Ltd., a subsidiary formed for the manufacture of synthetic rubber seals and glands, Mr. Dowty stated that the company was firmly established and that its future prospects were exceedingly good, further rapid expansion being necessary.

Speaking of foreign sales, Mr. Dowty announced that orders from abroad had been gratifying and at present the company was working on contracts for 15 foreign countries. Important contracts which should form the basis of profitable future trading has been undertaken by the Dowty Company in Canada. Mr. Dowty concluded by reviewing the financial position of the company and announced that, having regard to the request of the Chancellor of the Exchequer that dividends should be limited, the Directors had recommended the payment of a final dividend of only 3 per cent, free of income tax, although the profits earned would justify a much larger distribution. This dividend, when added to the interim dividend of 10 per cent free of tax, making a total of 13 per cent tax free, is the same as the gross distribution for the previous year, which was 23.6 per cent.

ACCIDENT INVESTIGATION

Lord Pakenham Refuses to Set Up Board Suggested by Newton Committee

WHILE he was Minister of Civil Aviation, Lord Nathan set up within the National Civil Aviation Consultative Council a Committee on Accident Investigation Procedure, under the chairmanship of Mr. C. M. Newton. Members of the committee were Major R. H. Mayo, Mr. J. S. Nicholl, Mr. W. Bently Purchase, Mr. C. N. Shawcross, M.P., and Mr. Brian Davies (secretary). The terms of reference were: "To enquire into the procedure governing investigations into accidents to civil aircraft in the United Kingdom and to British civil aircraft abroad, and the make recommendations."

The report of the Newton Committee has now been published (Cmd. 7564). It is accompanied by a Memorandum by the Minister of Civil Aviation. Following is a summary of the main recommendations of the Committee:

I. No further Inspector's Investigations should be held in public.

II.—(1) A Civil Air Accident Board should be set up composed of a Chairman and eleven members.

(2) The Chairman should have legal qualifications and experience and be appointed by the Minister after consultation with the Lord Chancellor.

(3) The members of the Board should be appointed by the Minister on the recommendation, as to one each, of the bodies specified in paragraph 61.

III. Six Commissioners of Civil Air Accidents, barristers who have practised for not less than ten years should be appointed by the Minister after consultation with the Lord Chancellor.

IV. A panel of technical Assessors, including persons nominated by the pilots' organizations, should be maintained by the Board.

V. The Chief Inspector of Accidents, together with the requisite staff, should be responsible to the Board.

VI. An aircraft accident should be defined as an occurrence which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which (a) any person suffers death or serious personal injury while in or upon the aircraft or by direct contact with the aircraft or anything attached thereto; or (b) the aircraft suffers substantial damage.

VII. An aircraft incident should be defined as an occurrence not amounting to an accident which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked in which the safety of the aircraft or any person is threatened.

VIII. Notification of accidents should be given to the Board by the person immediately responsible for the operation of the aircraft at the time of the accident, or if he be killed or incapacitated, then by the owner, hirer, or other person on whose behalf he was in charge, as the case may be.

IX. Notification of incidents to British aircraft should be given as in the case of accidents; save that an incident need not be notified to the Board if at the time of the occurrence the aircraft was neither (a) carrying passengers for hire or reward; (b) being used for any commercial or industrial purpose or otherwise for the purposes of gain.

X. A Commissioner's Inquiry should be held into every accident to an aircraft which at the time of the occurrence was engaged in carrying passengers or goods for hire or reward.

XI. The Board should have a discretion to direct a Commissioner's Inquiry into any other accident or into any notifiable incident.

XII. Assessors at a Commissioner's Inquiry should be provided by the Board from its panel as requested by the Commissioner.

XIII.—(1) Proceedings at a Commissioner's Inquiry should be held in public.

(2) The Chief Inspector of Accidents should be responsible for the preparation and presentation of the evidence.

(3) Interested parties should be entitled with leave of the Commissioner, to appear either in person or by legal or other representative, to cross examine witnesses and to call evidence.

(4) The Rules of evidence should be observed; hearsay should not be admitted. Evidence should be taken on oath.

XIV. Reports of Commissioner's Inquiries should be made to the Board and transmitted by it to the Minister who should publish them forthwith.

XV. An Inspector's Investigation should be carried out by the Chief Inspector of Accidents into accidents into which a Commissioner's Inquiry is not being held, and into such notifiable incidents as the Board directs.

XVI. Proceedings of an Inspector's Investigation should be informal and in private. Interested parties should not be present either in person or by representative.

XVII.—(1) Reports of Inspector's Investigations should be made to the Board and should not be published.

(2) The Board should communicate the gist of the conclusions and recommendations to interested parties.

XVIII. A bi-annual Review of its activities and progress should be made by the Board to the Minister who should publish it.

XIX. Effect might be given to the above recommendations by Regulations made under Section 12 of the Air Navigation Act, 1920, or by Order in Council together with regulations to be made thereunder, under Section 1 (2) (h) of the Air Navigation Act, 1947.

XX. The Accident Regulations 1922-35 should be revoked and replaced as in recommendation XIX.

MEMORANDUM BY THE MINISTER OF CIVIL AVIATION

COMMENTS ON THE REPORT

IN presenting this Report to Parliament, it is convenient to indicate those recommendations with which His Majesty's Government is in agreement and those which it is unable to accept.

Recommendations I, III and VI are accepted without reservation.

Recommendation VIII is accepted with the substitution of the words "Chief Inspector of Accidents" for "the Board."

Neither Recommendation II (that a Civil Air Accidents Board should be set up) nor the recommendations consequential upon it, i.e. numbers V, XI, XIV, XV, XVII and XVIII can be accepted for the following reasons:—

(a) The composition of the Board as proposed in para. 61 of the Report is unsuited to its intended duties. The primary purpose of the Board is not to perform any technical function, but to exercise an independent discretion. But, with the exception of the Chairman and one other member, the membership recommended consists of a number of nominees from bodies directly interested in the majority of accidents together with representatives of four Government Departments, including the Ministry of Civil Aviation. The Board would not satisfy the criteria laid down by the Committee in para 29 (b) of the Report. If the Board were to exercise real authority it would have to meet very frequently, if, indeed, it were not in almost continual session.

(b) The duties of the Board envisaged in para. 66 of the Report are not confined to directing the investigation of accidents. They would impinge upon the functions of the Air Registration Board and the Minister's general responsibility in connection with safety in the air now exercised by him through the Directorate of Air Safety.

(c) The Minister has a statutory and an international responsibility for air safety in general of which the proper investigation of accidents is an important part, and it would not be right for him to divest himself of this responsibility and delegate it to a Board over which he would have no control except by terminating the appointment of individual members or by revoking the Order or Regulation under which it was set up

(d) The machinery of accident investigation would become cumbersome and costly.

The above objections, except (a), would apply with equal force to any Board, whatever its membership.

With regard to recommendations VII and IX about "incidents," the importance of putting their notification on an organized basis, and of ensuring machinery for their proper investigation where appropriate is accepted; the most suitable procedure is under consideration.

In recommendation X and XI, the Committee propose that a formal public Inquiry should always be held into a defined

Accident Investigation . . . . .

category of accidents and that the proposed Board should have a discretion to direct such an Investigation in other cases. For the reasons given below this cannot be accepted.

As the Committee point out in paragraphs 33 and 80 of the Report, to require a public judicial investigation into every accident is unnecessary and would often be a waste of time and effort. But the category defined in paragraph 80 and Recommendation X would involve holding public investigations into the great majority of accidents, and would often mean employing an unnecessarily cumbersome and expensive procedure which would not be justified by the results. The Committee are themselves anxious to avoid this, as emphasized in paragraphs 117 and 118. The analysis of accidents given in paragraph 119 of the Report covering a selected period is not truly representative and does not reflect accurately what the Committee's recommendations would involve. The Committee's proposal might necessitate holding some 30 or more public investigations a year, many of them into comparatively trivial occurrences.

The circumstances surrounding accidents to aircraft vary so infinitely that it is not possible to define a category for formal public investigations which would be satisfactory, practical and reasonably logical. Each case must be decided in the light of all the attendant circumstances and the requirements of the public interest. While it is considered that the right course is for the Minister to decide each case on its merits, it has been concluded, after a review of past practice, that there should be more Court Investigations in future and below are set out certain specific criteria to which the Minister will give particular attention in so deciding.

With regard to the position of the Minister as an "interested party" and that of the Chief Inspector of Accidents, which are considered in paragraphs 41 to 49 of the Report, the difficulty which the Committee envisaged is theoretical rather than real, as appears from the categorical statements in paragraph 45 of the Report. The exercise of what is in a sense a quasi-judicial discretion, in addition to his usual administrative and executive responsibilities, is part of the normal functions of a Minister of the Crown and the Committee do not contend that there is any risk that the Minister would exercise his discretion dishonestly and decline to direct a public investigation lest misdeeds of his officers should come to light. Moreover, the fact that the Minister is answerable to Parliament for the exercise of his discretion is the best possible safeguard that it is properly exercised. Nor can it be seriously suggested that an Inspector of Accidents might so fail in his duty as to conceal blameworthy conduct by employees of the Ministry.

It is agreed that at a public investigation, the President of the Court should have the assistance of appropriate technical assessors if he so desires, but it is thought to be better that the assessors should be appointed ad hoc, rather than from a pre-selected panel, as proposed in recommendation IV. It is important that the most suitable persons according to circumstances should be appointed and that the field of selection should not be restricted to a panel. It is not, therefore, proposed to accept Recommendations IV and XII.

Parts of recommendations XIII and XVI, though with considerable modifications, have been incorporated into the new form of investigation procedure explained below.

PROPOSED NEW PROCEDURE

COMPLAINTS about the present accident investigation procedure have largely focused on criticisms:—

(a) that too few Court Investigations have been held;

(b) that the holding of Inspectors' Investigations in public is not satisfactory;

(c) that blame should not be allocated in Inspectors' Reports to persons who have not had an opportunity of cross-examining the witnesses on whose evidence they are found to blame or who have not, as in the case of dead pilots, been able to put their case to the Inspector.

To meet these points, a new procedure has been evolved. It is thought that this procedure will go far towards meeting the difficulties which the Committee had in mind, while avoiding the establishment of an elaborate, cumbersome and costly machine, and leaving the Minister's ultimate responsibility to Parliament unimpaired.

It has been decided to introduce the following procedure:—

Preliminary

(i) When the Inspector of Accidents has decided that an accident requires investigation, he will proceed to make preliminary investigations forthwith. At the same time, public notice will be given that a preliminary investigation is taking place into the cause of the accident, and that any persons interested who desire to make representations as to the circumstances or causes of the accident should do so in writing within a time specified in the notice.

(ii) As soon as possible after that time has elapsed, the Inspector will report to the Minister indicating

(a) whether the preliminary enquiries point to the possibility that serious negligence on the part of anybody, including manufacturer, operators, flying crew, traffic control or otherwise, may have been a contributory cause of the accident; or

(b) whether there was a serious structural failure or failure of equipment or any other notable occurrence which ought not to have occurred without serious negligence.

(iii) On receipt of this preliminary report from the Inspector, the Minister will decide whether to instruct the Inspector to complete his investigations to comply with a full Inspector's Investigation, or to order a Court Investigation. In so deciding the Minister will have regard, amongst other matters, to the criteria indicated above, and also the following:—

(a) whether the procedure of a public Court Investigation would be more likely than a private enquiry to enable the cause of the accident to be determined; and

(b) whether the accident itself was of a sufficiently serious kind, or attended by other circumstances likely to disturb public confidence either in the safety of travel by air or in the manner in which the functions of the Ministry or of the operators are being conducted, regard being had to any representations made by interested parties as provided for in (i) above.

Inspector's Investigations

(iv) Inspectors' Investigations will be held in private.

(v) The Attorney-General, as representing the public interest, will be entitled to intervene at any stage of an Inspector's Investigation, if he thinks fit, in order to make representations or to cross-examine witnesses; to this end he will be provided with a copy of any representations which have been made by interested parties. Arrangements will be made to keep the Attorney-General informed of all Inspector's Investigations.

(vi) Where there is any significant conflict of evidence on an important issue of fact, the Inspector will allow interested parties to cross-examine the witnesses in question, if he thinks that the interests of justice and fairness so require.

(vii) The Inspector will not, in his Report to the Minister, attribute blame to any persons unless an opportunity has previously been given to such person, or, if he be dead, then to the legal personal representative of such person, of making any statement or giving any evidence and producing any witnesses on his behalf, and, unless by reason of the absence of the witness overseas or other good cause it does not seem to the Inspector of Accidents reasonably practicable so to do, of questioning any witnesses from whose evidence it appears that such person was blameworthy.

(viii) Where witnesses are being cross-examined before an Inspector under (vi) or (vii) above, a representative of the Treasury Solicitor will sit with the Inspector to afford him any legal advice or guidance he may require.

(ix) The Inspector's power to summon witnesses and to require the production of documents in Regulation 5 of the Air Navigation (Investigation of Accidents), 1922, will be extended to correspond with the powers of Court under Regulation 7 (3) (1) (b) of those regulations.

(x) Regulation 6 (ii) of the 1922 Regulations (which empowers an Inspector to include in his Report a recommendation for the cancellation, suspension or endorsement of any licence or certificate) will be revoked.

(xi) Subject to (a), (b) and (c) of paragraph (xv) below, Reports of Inspectors' Investigations will continue to be published as soon as possible after presentation to the Minister as a matter of course when they fall within my predecessor's undertaking to the House of Lords of October 24th, 1946, which is set out in Annex C to the Report of the Newton Committee. In addition, any other Report will be published at the request of any interested party

(xii) At any stage of an Inspector's Investigation or after such an Investigation has been concluded, the Minister may order a Court Investigation if he considers the public interest so requires

Court Investigations

(xiii) These will be conducted by a President appointed from a panel of persons with legal qualifications nominated

(*Continued at foot of next page.*)

O.U.A.S. DINNER

ON Friday evening, November 26th, members and guests of the Oxford University Air Squadron met together, for the Squadron annual dinner, at the Randolph Hotel.

W/C. C. N. Foxley Norris, D.S.O., the chief instructor, proposed the toast of "the guests," but this, as usual, was but the epilogue to a model speech reviewing the condition of the Squadron and including some trenchant observations on the need for Tiger Moth replacement. Before this, however, the C.I. welcomed Air Marshal Sir Hugh Saunders, the Air Member for Personnel, Dr. G. N. Clark, the Provost of Oriel, and Air Marshal Sir Alan Lees, A.O.C. in C., Reserve Command. In addition, a warm welcome was extended to the heads of no fewer than six colleges, and to the C.O.s and officers of five other University Air Squadrons.

In regard to the O.U.A.S. position, this was eminently satisfactory. At the start of the current term a recruiting drive was initiated, with such excellent results that the present establishment was up to the maximum permissible figure of 100; further, there was a waiting list. Not only this, but Squadron attendance had increased.

Replacement of the Squadron's Tiger Moths was urgent. There was a desperate need for an all-weather training aircraft, for an all-weather air force needed an all-weather reserve.

The Provost of Oriel responded for the guests in sparkling terms, and to cries of "Shame" observed that he was also a Fellow of a Cambridge college. (Dr. Clark was Regius Professor of Modern History between 1943 and 1947, and Fellow of Trinity College, Cambridge). He stated that in his journeyings between Oxford and Cambridge he went via Bletchley, and all that was very out of date—particularly Bletchley. He thought that the R.A.F. had shown the way, and suggested a 100 per cent air lift between the two universities.

Air Marshal Sir Hugh Saunders, in proposing the toast of "The Squadron," paid tribute to that great man Dr. Stallybrass, the late Vice-Chancellor, whose wise counsel and great interest in the Squadron was going to be so sadly missed. He then said he had taken to heart the remarks of the C.I. (regarding new aircraft) and would pass on the requirements.

Of the future, the Air Marshal stated that it would be madness to neglect our defences, particularly the air force, for it was now universally acknowledged that the R.A.F. was our first line of defence. To-day the demand was for a very high standard indeed, and it was no secret that the hope was to get some of the hard-core of the new Air Force from the University Squadrons.

The response on behalf of the Squadron was made by Mr. A. J. B. Scholefield, of Oriel College (the undergrads of which make up no less than 19.78 per cent of Squadron strength). It was one of the best speeches the writer has ever heard made by a young man.

AEROMODELLERS ACCLAIMED

A DINNER at the Dorchester last Thursday was a fitting occasion on which to honour those members of the Society of Model Engineers whose recent performance at Akron, Ohio, secured until next year the coveted Wakefield Cup.

Proposing the toast of "The Winning Team," the Right Hon. Lord Pakenham, Minister of Civil Aviation, felt that, as in Anstey's *Vice Versa*, his aeromodeller son might well have taken his place. Who should be first in aeromodelling would, in Lord Pakenham's view, be first in the air.

Mr. R. B. Chesterton (the winner) replying, recalled that the British team met for the first time only seven weeks before the contest, which was fought out in a temperature of 102 degrees. He was enthusiastic in his tribute to our American hosts and foresaw stiff competition next year.

The Rt. Hon. George Tomlinson, M.P., Minister of Education, who was to have proposed "The Society of Model Aeronautical Engineers, coupled with The Royal Aero Club," had been detained in the House of Commons, but Mr. F. Bray, Under-Secretary for Further Education, spoke—most encouragingly in the view of modellers present—in his stead.

Replying, Sir Robert Bland Bird, Bt., M.R.I., referred to the "wonderful prescience" of Lord Wakefield. He expressed the hope that the Cup would "oscillate" between the four quarters of the globe, and that the contest would never share the fate of the Gordon Bennett race, and gradually be divested of its spirit of sportsmanship

Sir Patrick Hannon, M.P., proposing "*La Fédération Aéronautique Internationale*," spoke inspiringly of the "exalting, refining and stimulating influences" of the Federation, and Mr. A. F. Houlberg, replying, referred to the "regrettable number" of model aircraft records held by the U.S.S.R.

"Our American Hosts" was proposed by Lord Brabazon, who thanked Sir Robert Bland Bird, the host of the evening. Lord Brabazon described himself as "a human pterodactyl." Two forms of aerial *sport*, he believed, remained—model flying and gliding.

Mr. Percy E. Charley, an American guest, in his reply hoped for "a little less hobby and a little more science," and looked forward to the inclusion of aeromodelling in the school curriculum. His speech epitomised the brotherhood of sportsmanship linking British and American aeromodellers.

DEVELOPMENT OF THE MAMBA

IN its two-and-a-half years' existence, the Armstrong Siddeley Mamba turboprop has been developed to the stage of being a type-tested engine with over 5,000 hours' test bed running and 100 hours' flying. In his paper, *The Development of the Armstrong Siddeley Mamba Engine*, read before the Royal Aeronautical Society at the Institution of Civil Engineers on Nov. 25th, Mr. W. H. Lindsey, M.A., A.F.R.Ae.S., Assist. Chief Designer of Armstrong Siddeley Motors, Ltd., said that the first proposal for the turboprop, which subsequently became the Mamba, came from the Director of Engine Development, in 1945. It was to do the same job as an 850 h.p. radial piston engine which was being developed by the company at that time. As it was necessary to provide 850 s.h.p. for take-off anywhere, the gas turbine engine had to be designed to give the power at about 5,000ft under tropical conditions, which fixes the standard I.C.A.N. sea-level power at 1,000 s.h.p.

A recent development of great interest was mentioned by Mr. Lindsey, namely, the redesign of the compressor and turbine which had led to an important increase in power. This new compressor, with efficiency greater than 85 per cent, formed the basis of the Mamba 2 now undergoing development, and early performance testing had already shown that the new engine could be developed to give at least 1,300 s.h.p.

(A review of Mr. Lindsey's lecture and the subsequent discussion will be published next week.)

ACCIDENT INVESTIGATION (Concluded from page 672)

by the Lord Chancellor. Where appropriate, the President will have the assistance of one or more assessors appointed ad hoc by the Minister after consultation with the President.

(xiv) The procedure will be that laid down by Regulation 7 of the Air Navigation (Investigation of Accidents) Regulations, 1922. The Attorney-General will, if he desires, appear in order to represent the public interest; interested parties may be represented, cross-examine witnesses or call evidence themselves. The extent to which the strict rules of evidence should be observed will be left to the discretion of the Court in each case.

(xv) Subject to (a) and (b) below, Reports of Court Investigations will invariably be published. These Reports (and also Reports of Inspectors' Investigations which are to be published in accordance with (xi) above) will be published as soon as possible after presentation to the Minister, except:—

(a) on security grounds;

(b) where a foreign aircraft is involved and the agreement of the foreign government must first be obtained;

(c) where it seems likely that criminal proceedings may be instituted and it appears that publication of the Report pending those proceedings would be an injustice to the accused.

The Air Navigation (Investigation of Accidents) Regulations, 1922 to 1935, will be revoked and replaced by a new consolidated set of Regulations. Meanwhile, the procedure indicated above will, so far as possible, be brought into effect forthwith.

PAKENHAM.

November, 1948.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers not necessarily for publication, must in all cases accompany letters.

RAM TEMPERATURE RISE

Local Heating May Result

TO avoid misunderstanding, I should qualify my statement in *Flight* of November 18th that the ram temperature rise depends on the air density. More correctly, it depends on the initial air temperature, but at the speeds in question aircraft would presumably fly at altitudes where both density and temperature approach zero. Within the stratosphere the temperature rise is independent of altitude.

Of more immediate concern, the temperature rise depends also on the pressure rise, which at supersonic speeds may be reduced by small body angles obtained with high fineness ratios. While nose and leading edges may be heated, the pressure falls at the centre section, which may thus be cooled, except at transonic speeds.

At least there is no cause for undue pessimism.

Manchester, 19. G. R. BARRATT.

BIG-WING VERSUS BIG-STICK

Comparative Range Efficiencies

IN his interesting article in the October 21st issue, "Favonius," in comparing the Northrop B-35 with the Convair B-36, states that "the maximum range of the B-35 with a 30,000-lb bomb load is actually greater than that of the B-36 with 10,000 lb of bombs." This seems very improbable in view of the vast difference in fuel capacity of the two aircraft. He does not give any figures for the B-36, but reckons the capacity of the B-35 at 14,000 U.S. gallons, which, according to my information, is considerably less than that of the B-36.

I have in my possession a brochure which I received when visiting the Convair plant at Fort Worth in 1947. This gives a fair amount of "gen," both regarding the plant and the B-36, which I saw under construction. To quote: "The B-36 wing, which has integral fuel tanks, contains a total of 21,116 U.S. gallons of gasoline." Thus the B-36 carries approximately 7,000 gallons more than the B-35, and in view of this fact, I would hardly doubt another statement of the brochure to the effect that the B-36 can carry 10,000 lb of bombs for a range of 10,000 miles. L. TOULSON.

Stockton-on-Tees.

"FAVONIUS" replies from the U.S.A. as follows:—

Mr. Toulson is quite correct regarding the normal fuel tankage of the B-36 at the time of his visit in 1947, but seems to have overlooked the fact that this aircraft has six engines to burn up the gas, as against the four of the B-35. Moreover, by virtue of the superior aerodynamics of the all-wing principle (despite the lower aspect ratio), the Big Wing has a more efficient airframe than the Big Stick, as measured by a minimum drag coefficient some 25 per cent less and a maximum lift/drag ratio about 10 per cent higher. On top of this, the structural efficiency of the B-35 is also higher, as reflected in the ratio of useful load (bombs plus fuel) to gross weight—roughly 55 per cent for the B-35 and 50 per cent for the B-36.

Maximum range is not primarily a question of the biggest fuel capacity, but is proportional to the specific fuel consumption in lb/h.p./hour. Obviously, since both aircraft mount similar type engines, this value is the same for both. I also assumed equal values for the airscrew propulsive efficiencies, in view of the similar pusher power plant installations. The other two variables in the range equation are the maximum L/D ratio and the (take-off weight)/(landing weight) ratio, both of which are higher for the B-35 because of the reasons already quoted. Inserting the appropriate ingredients in the mathematical mill and turning the crank, the score-register turns up 8,400 miles for the B-35 and 7,600 for the B-36. However, just to be unbiased, I threw in a bonus of 400 miles in favour of the B-36 and called it 8,000 miles!

Both aircraft can extend these ranges by mounting additional fuel cells in the bomb bay, but whereas the gross weight of the B-35 remains unchanged (since the 30,000 lb bomb load can be reduced to 10,000 lb), the gross weight of the B-36 must be increased; thus, the latest edition, the B-36B is now planned for a gross weight of 326,000 lb. The corresponding range with a 10,000 lb bomb load then becomes approximately 9,000 miles, as against 10,400 for the B-35. Furthermore, the rest of the B-36 performance will decline because of the increased gross weight, whereas that of the B-35 remains unaltered.

While I appreciate the critical comments and interest of your correspondent, it seems to me that he has confused mere size with performance. And I mean the performance of an aircraft in the air and not that of the publicity writer. The B-36 has been sold to the American taxpayer as the Big Stick that will talk softly to the Russians, but if Mr. Toulson will turn back the pages of his history book to the year 1588, he will read what happened to the biggest galleons in the world of that time. One should not confuse bigness with greatness.

FIRE-FIGHTING EQUIPMENT

Half-tracked Vehicles Should Be Included

AN accident to a York aircraft at Ringway airport on the 15th of last month has again demonstrated the complete impotence of fire-fighting equipment stationed on the airfields of this country when an aircraft overshoots the airfield and comes to rest outside the perimeter. In many cases this means that the aircraft has ploughed through a hedge or two and is on soft ground, perhaps amongst tree stumps or bracken.

As in this instance, the station fire engines and ambulances hurry to the airfield perimeter but are quite unable to cross the hedges or traverse the soft ground, and they either become hopelessly bogged or have to give up the task. If the aircraft is on fire then the crew perish.

The fact that a system of "crash exits" exists on a number of airfields (only R.A.F. ones, I believe) affects the position very little, since, although the crash tenders have a means of crossing the boundary, they are still liable to become bogged in the next field. Moreover they may not even be able to reach the airfield boundary, as tenders have been known to become bogged on the airfield itself.

A "half-tracked" vehicle completely overcomes the difficulty of moving across farm land and can reach a crash in a neighbouring field in a very short time indeed, *and every second counts*. Such vehicles must be available in large numbers since the war, and conversion to a foam-carrying tender cannot be difficult or unduly costly, if, indeed, cost enters into a subject of life saving.

Since the shortcomings of the normal fire tender have been very obvious for many years, and have been demonstrated over and over again during the war, it is incomprehensible to me why situations should still arise in which the fire appliances cannot reach the fire.

Maidenhead, Berks. J. O. MATHEWS.

FORTHCOMING EVENTS

Dec. 2nd.—R.Ae.S. (Isle of Wight): "The Development of the Armstrong Siddeley Mamba Engine," W. H. Lindsey, M.A., A.F.R.Ae.S.

Dec. 2nd.—Royal Aeronautical Society: "Problems in the Development of A New Aeroplane," G. R. Edwards, M.B.E., B.Sc. F.R.Ae.S.

Dec. 3rd.—R.Ae.S. (Portsmouth): Film, "How an Aeroplane Flies."

Dec. 7th.—R.Ae.S. (Graduates and Students): Papers read by Members.

Dec. 7th.—Handley Page Engineering Society: "Aircraft Photography," John Yoxall.

Dec. 7th.—R.Ae.S. (Belfast): "The Weight Aspect in Aircraft Design," L. W. Rosenthal, A.F.R.Ae.S.

Dec. 8th.—R.Ae.S. (Preston): "Gusts," Prof. A. A Hall, M.Sc., M.A. F.R.Ae.S.

Dec. 9th.—R.Ae.S. (Coventry): Lecture by E. Smith.

Dec. 11th.—British Interplanetary Society: "The Problem of Interplanetary Flight (Part I.)—Two Papers. "The Dynamics of Interplanetary Flight," A. C. Clarke and "Limitation of the Chemical Rocket." A. V. Cleaver.

Dec. 14th.—R.Ae.S. (Belfast): Film Evening.

Dec. 15th.—R.Ae.S. (Weybridge): Annual General Meeting.

Dec. 15th.—Herts and Essex Aero Club: Annual Ball, Park Lane Hotel.

Dec. 16th.—Royal Aeronautical Society: "Present thoughts on the Use of Powered Flying Controls in Aircraft," D. J. Lyons.

Dec. 16th.—R.Ae.S. (Isle of Wight): Annual General Meeting and Film Show.

Dec. 17th to Jan. 20th.—Royal Geographical Society and Institute of Navigation: Joint exhibition, "Navigation through the Ages." Lecture. Dec. 17th.—"Radio and Position," Sir Robert Watson-Watt, C.B., F.R.S. Lecture Dec. 20th.—"The Navigator's Story," Prof. E. G. R. Taylor and Prof. W. M. Smart. Jan. 10th.—Three films on radio systems. Commentary by R. F. Hansford.

Dec. 17th.—R.Ae.S. (Portsmouth): "Some Aspects of Carrier Operation," Capt. (E.) B. H. Cronk, D.S.C., R.N. (Retd.).

Dec. 21st.—R.Ae.S. (Graduates and Students): "Production—The Dynamics of People at Work," J. V. Connolly, B.E., A.F.R.Ae.S.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

WARMER WATERS : A sunny scene from the superstructure of H.M.S. Theseus *during recent manoeuvres off the Cape Coast, showing a Sea Fury, Firefly and Sea Otter on the flight deck, with the destroyer* Corunna, *South African frigate* Natal *and light fleet carrier* Vengeance *in line astern. Now returning to the U.K., the Home Fleet will next week be engaged in exercises in the Channel and South-Western Approaches.*

R.A.F. Appointments

AIR MARSHAL SIR WILLIAM ELLIOT, K.B.E., C.B., D.F.C., the Air Officer Commanding R.A.F. Fighter Command, has been appointed Chief of Staff to the Minister of Defence, and Deputy Secretary (Military) to the Cabinet. The post was previously held by Lt. Gen. Sir Leslie Hollis, Commandant-General designate, Royal Marines.

After a year at the Air Ministry as Deputy Director of Postings A. Cdre. J. D. Baker-Carr, A.F.C., has taken up an appointment at the Ministry of Supply as Director of Armament Research Development (Air). A. Cdre. C. M. Heard, C.B.E., has been appointed Director of Weapons at the Air Ministry; he has been Deputy Director of Training (Weapons) since last April.

Increases in R.A.F. Pay

UNDER the new rate of pay announced on November 24th, and taking effect from that date, R.A.F. officers receive no increase in their basic rates of pay, although for those married officers not living in official quarters the marriage allowance will be increased by 6s a day. For those accommodated in official quarters the increase will be 3s a day, and married officers under 25 will continue to receive the highest "other rank" allowance. The weekly increases in marriage allowances for other ranks are: Corporals and below, 7s; sergeants, 9s; flight-sergeants, 10s; warrant officers, 11s.

Airmen also benefit from increased rates of pay, which vary between 6d and 1s 6d a day according to rank and trade. There are no pay increases for recruits, National Servicemen with less than 12 months' service, or A/C.2s in Groups C and D.

The increases in airmen's daily rates are shown below:

Increase of 1s 6d: All aircrew ranks other than gunners, signallers and engineers III and IV (B). All ranks in Group A trades, and warrant officers, flight sergeants and sergeants of all trades.

Increase of 1s: Gunners, signallers and engineers III and IV (B), L.A/C.s of Group B, and corporals of Groups B, C and D.

Increase of 6d: A/C.2s in Group B trades, and A/C.1s and L.A/C.s in C and D trades.

Pilot's Grave Found

THE grave of W/C. J. W. Gillan, D.F.C., A.F.C., who was reported missing from a daylight sweep in August, 1941, has been found at Dunkirk. W/C. Gillan was the commander of No. 111 Squadron when it became the first Hurricane-equipped squadron of the R.A.F., and on February 10th, 1938, made the famous flight in a Hurricane from Edinburgh to Northolt in 48 minutes—a ground speed of 408.75 m.p.h.

"Operation Attaché"

STATISTICS have been published by the R.C.A.F. covering the successful 16-day air search last September by Canadian and U.S. aircraft for the British and American attachés and their three companions, lost in the northland after a crash-landing while on a flight from the Hudson Bay port of Churchill to The Pas, Manitoba. The search was directed by G/C. Z. L. Leigh, and taking part were 23 R.C.A.F., four U.S. Coast Guard, and five U.S. Navy aircraft. Combined flying times during the operation totalled 1,140 hours, 30 minutes, with the R.C.A.F. flying over 750 hours; approximately 171,075 air miles were flown.

"The Show" on Tour

THE six R.A.F. tableaux on "Queen Mary" trailers seen in the Lord Mayor's Show which, as mentioned in a previous issue, are to go on a provincial recruiting tour, will be provided with casts by local reserve units during the tour. The well-constructed R.A.F. exhibits in the Show earned praise for their manufacturers—personnel of No. 4 Maintenance Unit, Ruislip.

Annual Overhaul

ANNUAL medical examination of all R.A.F. officers, which was suspended during the war owing to the administrative work involved, is to be re-introduced from next May. Unit medical officers will carry out the examinations each year during the months of May and June.

Hockey

PLAYING at the Old Deer Park, Richmond, on Saturday, November 20th, the R.A.F.'s hockey team beat Richmond by two goals to none. Both goals were scored in the second half, the players responsible being F/O. P. H. Jones (Cosford), and F/S. S. J. Durran (Bridgnorth). The other members of the team were: F/L. D. E. Wilkinson (Feltwell); F/O. M. Adams (Coningsby); F/L. E. A. Krarup (Bawtry); F/O. M. Chase (Binbrook); W/C. H. Budden (Benson); F/L. H. W. Wood (Hereford); F/L. E. B. Curtis (Lindholm); W/O. A. W. Tree (Benson); Sig. J. H. Johnson (Leuchars).

Plasticine Solves a Problem

THE carrying of such loads as coal and flour by aircraft on the Berlin air-lift is reported to have had a damaging effect on the instruments of the machines, with replacement often necessitated. A similar, though less serious problem recently arose at the Transport Command base of Oakington, near Cambridge, where Dakotas returning from Germany were found to have accumulated a thick layer of coal dust and flour beneath the floor-boards. Removal proved to be a lengthy task, and as a

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quickly found preventive measure, the floor-board joints were sealed with plasticine, the amount required being about 26 lb per Dakota. The treatment was completely effective, and has now been adopted throughout the Command for aircraft carrying this type of cargo.

R.O.C. Recruiting

APPLICATIONS to join the Royal Observer Corps totalled 916 during October, of which 754 were men and 162 were women. Recruiting for both is still open in all districts as the Corps still needs 15,000 to bring it to full strength. The age limits are 16-45 for service at centres, and 16-50 for service at posts.

Britannia Shield Scholarships

TWO scholarships of £100 a year have already been awarded from a fund started last year, at the Britannia Shield Committee's suggestion, with a grant of £700 from the profits on the 1947 competition for the Britannia Shield. The fund, which is for the assistance of children of regular officers, airmen or airwomen of the R.A.F. or W.A.A.F. in receiving a university education, has now been augmented by £400 from this year's profits.

R.A.F. Permanent Commissions

GENERAL DUTIES BRANCH.

Squadron Leaders: N. A. R. Doughty, D. W. Edmonds, D.F.C., A.F.C., R. A. Newberry, D.F.C.

Flight Lieutenants: A. S. Aldridge, D.F.C., G. F. Banyard, J. A. Bell, B. H. L. Blake, H. Broadmeadow, R. C. Brown, R. R. Charlton, D.F.C., D.F.M., J. Dalgleish, G. G. A. Davies, D.F.C., S. C. Dawson, C. O'Ellison, D.F.C., P. R. Farmer, C. E. Fielding, D. R. George, P. J. Gordon-Hall, D.F.C., E. R. G. Haines, D.F.M., D. B. Halcro, D.F.C., P. G. P. Henson, C. F. B. Hughes, D. M. Hunter, J. Jagger, A. M. J. Kent, R. McGugan, D. A. Maddox, J. E. Major, A.F.C., R. F. Marshall-Hardy, N. H. Mason, J. Midwood, L. Moore, D. P. Morrison, D. H. A. Skillings, J. C. Stead, D.F.C., S. J. Steel, F. J. Steer, D.F.C., E. Stephenson, E. S. Storey, R. S. Taylor, A.F.C., G. F. Turner, D.F.C., L. Turner, R. Waugh, D.F.C., F. E. Zaccheo.

Flying Officers: J. W. Abrey, E. W. Bunkhall. D. S. Collier, J. P. Di Banga, J. Etkins, T. D. Lamb, R. J. Linford, H. J. Heddings, A. V. E. Palmer, J. W. Scoble, M. O. Searle, S. C. Wright, D.F.C., J. A. Yeomans.

Pilot Officer: R. J. Bance.

TECHNICAL BRANCH.

Squadron Leader: J. J. Dennis, O.B.E.

Flight Lieutenants: G. Bucklow, A. Burdess, J. A. Cline, C. W. Clinch, E. A. Cotton, A. E. Dyball, F. Fazey, H. C. Flemons, A. Fraser, P. W. Gibb, B. H. Goodger, H. B. Jefferies, H. Jones, W. J. Knowles, G. A. Lorriman, A. E. Mayhew, E. F. Redwood, G. K. Scott, D.F.C., R. Simpson, R. E. Wardrop, T. E. Welding, G. W. E. Wooley, D.F.C., H. Woolstencroft, D.F.C.

Flying Officers: E. N. Cambrill, K. W. Neal.

SECRETARIAL BRANCH.

Squadron Leaders: H. A. Lax, G. G. Thompson, D.F.M.

Flight Lieutenants: H. J. Adams, R. K. Miller.

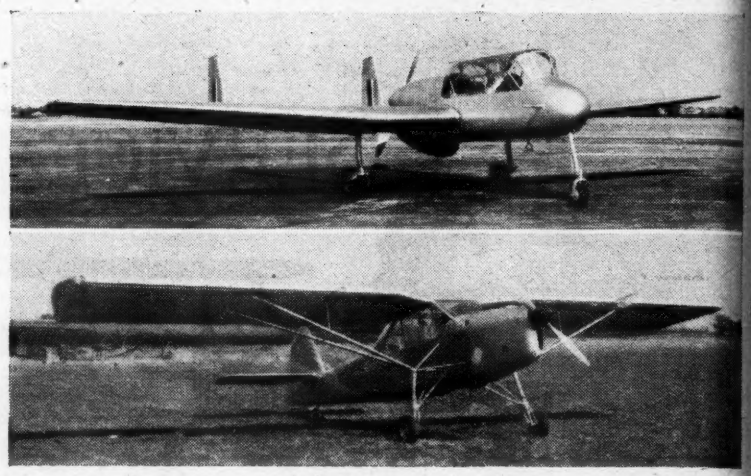
Flying Officers: W. D. Blythe, A. H. Cowton, T. H. B. Furness, J. A. Shillito.

AIRCRAFT CONTROL BRANCH.

Squadron Leaders: J. G. Barr, E. C. Bennett, D.F.M., J. S. Hamilton, D.F.C., A.F.C., L. S. Holman, A.F.C., J. H. T. Pickering, G. S. Smith, A.F.C.

Flight Lieutenants: R. W. Applebee, D.F.M., L. S. T. Baker, J. L. Berry, T. H. J. Cairns, D.F.C., D.F.M., J. G. Cave, S. Chester, E. L. J. Cook, J. F. L. Cowe, J. H. C. Dickie, F. E. Earnshaw, L. H. C. Gayfer, D.F.M., R. W. Greenaway, P. T. Hall, H. S. Hemsley-Hall, W. Hill, W. F. Hoffman, A.F.C., M. H. Hooper, A.F.C., E. F. Le Conte, S. P. Le Rougetel, G. B. Masters, D. G. Mossman, F. J. Mundy, W. S. Munn, D.F.M., J. M. Murray, D.F.C., D.F.M., H. S. L. T. Norcross. D.F.C., D. O'Leary, D.F.C., K. J. Plested, A.F.C., L. R. C. Russell, A.F.C., J. Seldon, A. Shaw, D.F.C., N. F. H. Smith, T. A. Stanton, E. J. Street, A.F.C.

Flying Officers: R. L. T. Bickers, J. E. Burrell, T. E. C. Court, C. M. Hare, A. A. Robertson, H. F. Shaw, G. F. Smith, D.F.M., B. G. Waight.



AIR OBSERVATION POSTS: Although both built to the specification A.2/45, the Heston (upper view) and Auster designs differ widely. A feature shared is the installation of a Gipsy-Queen engine.

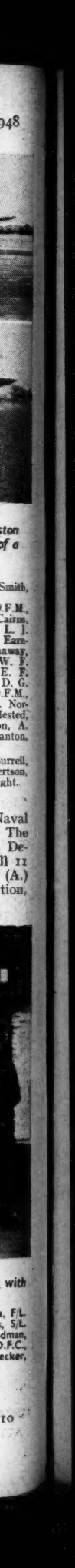
Reunion

A REUNION party for No. 4 Naval Fighter Wing will be held at The Chatelain, Gerrard Street, W.1, on December 23rd, 1948, from 7 p.m. till 11 p.m. Particulars from Lieutenant (A.) E. J. Clark, R.N., R.N. Air Station, Ford, Nr. Arundel, Sussex.

The R.A.F., Naval and civilian test pilots, flying personnel, and technical officers of the Flying Wing, A. and A.E.E., R.A.F. Boscombe Down, with their commander G/C. Dawkins.

Front Row (L. to R.): Lt. Crosley, D.S.C., S/L. Roberts, M.B.E., F/L. Marshall, D.F.M., F/L. Lumsdaine, D.F.C., S/L. Dobson, G/C. Purvis, W/C. Starks, D.F.C., G/C. R. C. Dawkins, S/L. Blackburn, D.F.C., Lt/Cdr. Kiggell, D.S.C., W/C. Barnard, O.B.E., F/L. Wiseman, D.F.C., F/O. Mackie, F/O. Hodge, F/L. Gunn.

Second Row (L. to R.): Lt. Harris, S/L. Kerslake, M.B.E., F/L. Hodder, F/L. Champness, F/L. Callard, D.F.C., F/L. Duncan, A.F.C., F/L. James, D.F.M., F/L. Stephens, F/L. Hemsworth, F/L. Robson, D.F.C., F/L. Haskett, F/O. Gees, F/L. Stocker, D.F.C., M. Plt. Price, D.F.M., F/L. Griffits.

Third row (L. to R.) Lt. Maclachlan, Lt. Goodhart, Lt/Cdr. Richmond, Lt/Cdr. Hawk, Lt/Cdr. Stuart, Mr. Pinchard, A.F.C., Mr. Murdoch, F/L. Brain, A.F.C., F/L. Cawdel, M.B.E., F/L. Finch, F/L. Atkins, A.F.C., A.F.M., F/L. Pearson-Kirk, Lt/Cdr. Wilson.

Fourth row (L. to R.) Lt. Reynolds, F/L. Stoop, Mr. Killikelly, Mr. Mills, S/L. Watt, F/L. Stark, D.F.C., S/L. Woodman, D.S.O., D.F.C., S/L. Barthropp, D.F.C., F/L. Crozier, F/L. Evans, F/L. Secker, F/L. Wilson-Hodgkinson.